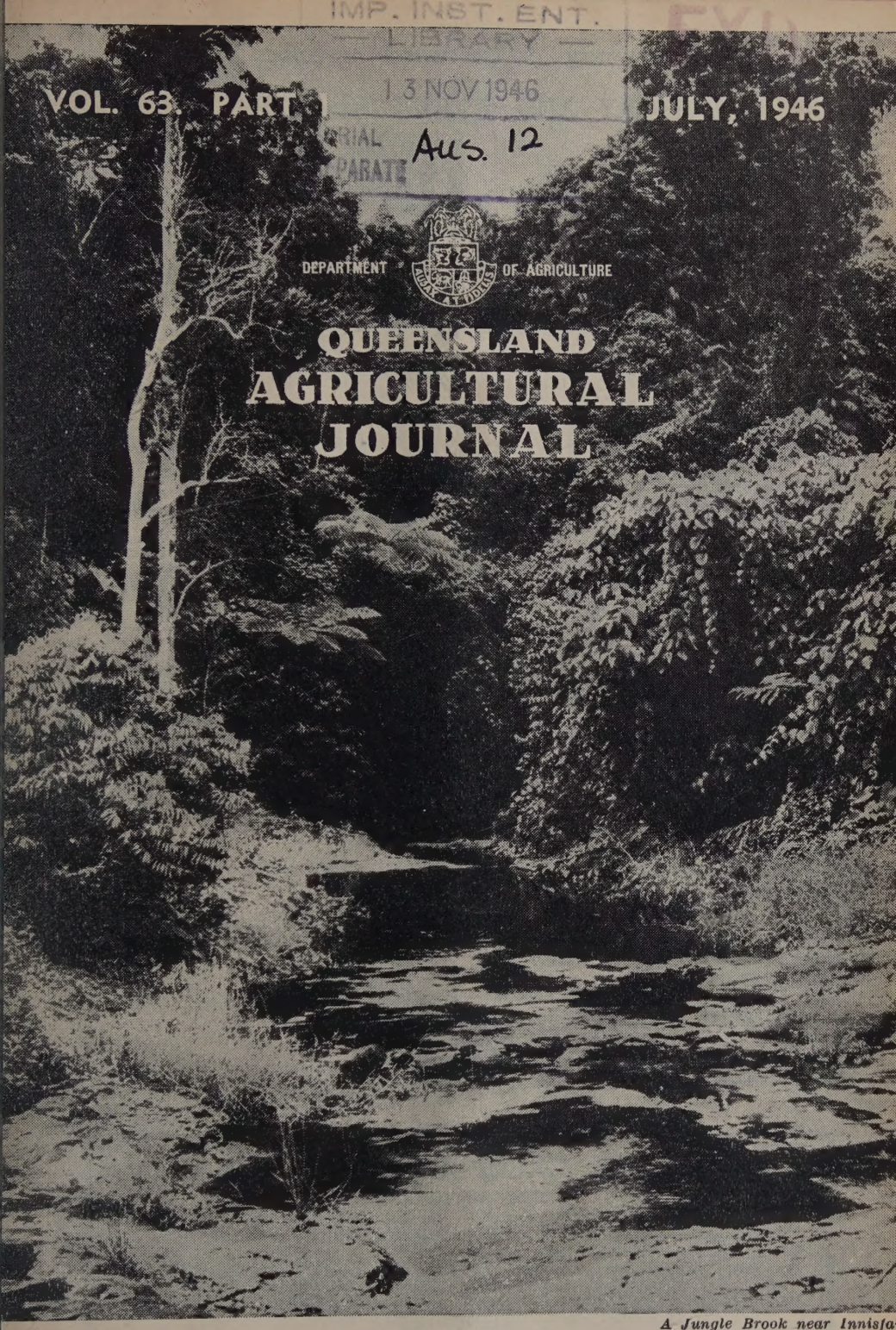
IMP. INST. ENT.
— LIBRARY —
13 NOV 1946
RIAL
PARATE
Aus. 12

VOL. 63. PART 1. JULY, 1946

DEPARTMENT OF AGRICULTURE

QUEENSLAND AGRICULTURAL JOURNAL



A Jungle Brook near Innisfa
North Queensland.

LEADING FEATURES

Grazing Winter Cereals
Lettuce-growing
Peanut Crown Rot
Control of Nematodes in Tobacco Seed-beds
Dairy Manufactures in New Zealand
Determination of Salt in Butter
Water on the Dairy Farm
Mortality in Pigs
Sex Determination of Day-old Chickens
Blackleg of Cattle
Leucosis in Poultry

Registered at the General Post Office, Brisbane, for transmission by Post as a Newspaper.

ADVISORY AND TECHNICAL SERVICES

Under Secretary	R. P. M. Short
Assistant Under Secretary (Technical)	A. F. Bell, M.Sc., D.I.C., A.A.C.I.
Assistant Under Secretary (Administrative)	M. L. Cameron
Special Administrative Officer	H. Barnes
Accountant	W. T. Gettons, A.I.C.A.
Division of Plant Industry—	
Director, Division of Plant Industry	R. Veitch, B.Sc.Agr., B.Sc.For., F.R.E.S.
Specialist Adviser, Experiment Stations, and Cotton Specialist	W. G. Wells
Agriculture Branch—	
Director of Agriculture	C. J. McKeon, Q.D.A.
Asst. Director of Agriculture	D. O. Atherton, Q.D.A., M.Sc.Agr.
Chief Adviser	W. H. Bechtel
Chemical Laboratory—	
Agricultural Chemist	M. White, M.Sc., Ph.D., A.A.C.I.
O/C Plant Nutrition Section	C. R. von Stieglitz, F.A.C.I.
Horticulture Branch—	
Director of Horticulture	W. A. T. Summerville, D.Sc.
Assistant Director	S. A. Trout, M.Sc., Ph.D.
Science Branch—	
Officer in Charge and Senior Pathologist	J. H. Simmonds, M.B.E., M.Sc.
Senior Entomologist	J. H. Smith, N.D.A., M.Sc.
Government Botanist	C. T. White
Sugar Experiment Stations—	
Director	A. F. Bell, M.Sc., D.I.C., A.A.C.I.
Asst. Director and Chief Mill Technologist	E. R. Behne, B.Sc., M.Sc.App., A.A.C.I.
O/C Entomology and Pathology	R. W. Mungomery
Division of Animal Industry—	
Acting Director, Division of Animal Industry	J. Legg, B.Sc., D.V.Sc., M.R.C.V.S.
A/Chief Inspector of Stock and Chief Inspector of Slaughterhouses	J. C. J. Maunder, B.V.Sc.
Acting Director of Research	F. H. S. Roberts, D.Sc.
Senior Adviser, Sheep and Wool	J. L. Hodge
Veterinary Officer, Sheep and Wool Branch	G. R. Moule, B.V.Sc.
Officer in Charge, Pig Branch	F. Bostock
Officer in Charge, Poultry Branch	P. Rumball, R.D.A.
Division of Dairying—	
Director of Dairying	E. B. Rice, Dip.Ind.Chem.
Senior Dairy Technologist	O. St. J. Kent, B.Sc., A.A.C.I.
Marketing Division—	
Director of Marketing	H. S. Hunter
Acting Asst. Director of Marketing	H. K. Lewcock, B.Sc.Agr., M.Sc.
Standards Officer	F. B. Coleman
Publications—	
Editor	J. F. F. Reid
Associate Editor	C. W. Winders, B.Sc.Agr.

BEAUTIFUL CREEPERS NOW ON SALE

BOUGAINVILLEAS

Badgen's Beauty (rich purple) 2/6 each.
Magnifica Trailli (rosy purple) 2/- each.
Glabra Sandriana (violet) 2/- each.
Mrs. Butt (crimson lake) 2/6 and 3/6 each.
Turley's Special (large crimson) 3/6 each.
Thomasii (rose pink) 2/6 and 3/6 each.
Louis Waltham (orange) strong plants, 3/6 each.
Brick red shades, in variety Laterita, Marada, and Grimleyii, 3/6 each.

BIGNONIA

Venusta (Chinese Tears) beautiful orange flowers, 2/- each.

All obtainable from

THOS. PERROTT & SONS

Incorp. PETERSEN BROS. & CRAIG PTY.

337 George Street **Brisbane**

Volume 63 Part 1

QUEENSLAND AGRICULTURAL JOURNAL

Edited by
J. F. F. REID
Associate Editor
C. W. WINDERS, B.Sc.Agr.

JULY, 1946

Issued by Direction of
THE HONOURABLE H. H. COLLINS
MINISTER FOR AGRICULTURE AND STOCK

GOVERNMENT PRINTER, BRISBANE

Contents

	PAGE.
Event and Comment—	
Rural Development in Queensland	3
Service to the Dairy Industry	4
Field Crops—	
Grazing Winter Cereals on the Darling Downs	5
Vegetable Production—	
Lettuce-growing	9
Plant Protection—	
Peanut Crown Rot	18
Control of Nematodes in Tobacco Seed-beds	20
The Dairy Industry—	
Observations on Dairy Manufactures in New Zealand	23
Determination of Salt in Butter	30
Water on the Dairy Farm	33
The Pig Farm—	
Mortality in Pigs	38
Points in Piggery Management	39
The Poultry Farm—	
Sex Determination of Day-old Chickens	40
Registered Hatcheries	44
Animal Health—	
Blackleg in Cattle	47
Leucosis in Poultry	51

	PAGE.
General Notes—	
Staff Changes and Appointments	56
Use of Term "Co-operative"	56
Phylloxera in Grapes	56
Control of Brumbies	56
Elections of Commodity Boards	56
New Banana Case	56
Wild Life Preservation	56
Peanut Board	56
Rural Topics—	
The Australian Farmer—Mr. Bankes Amery's Tribute	57
"Iron Rations" Not Good for Dairy Cows	57
No Runts Among the Grunts	57
Gadgets and Wrinkles—	
Automatic Unloading	58
A Useful Automatic Roll-in Stacker	58
The Farm Home—	
Care of Sick Children	59
In the Farm Kitchen	60
Queensland Weather in June	61
Astronomical Data for Queensland	62
Rainfall in the Agricultural Districts	63
Climatological Data for May	63

STATE'S SEEDS ARE GOVERNMENT TESTED

	Bushel s.	d.
BEANS—Brown Beautys	70	0
BEANS—Canadian Wonders	82	6
BLUE LUPINS, N.Z.	13	6
DUN FIELD PEAS	15	0
SEED BARLEY	6	6
	lb.	
PUMPKINS—Beaudesert	5	0
PUMPKINS—Cattle	2	6
RAPE—Dwarf Essex	1	1
RAPE—Giant Kangaroo	1	2

ASK FOR YOUR REQUIREMENTS

SEED POTATOES

Brownells, Factors, Carmens, and Certified Factors

Delivery When Required

ORDER NOW

State Produce Agency Pty. Ltd.

ROMA STREET BRISBANE

ANNUAL RATES OF SUBSCRIPTION.—Queensland Farmers, Graziers, Horticulturists, and Schools of Arts, **One Shilling,** members of Agricultural Societies, **Five Shillings,** including postage. General Public, **Ten Shillings,** including postage.

QUEENSLAND AGRICULTURAL JOURNAL

Volume 63 1 JULY, 1946 Part 1

Event and Comment.

Rural Development in Queensland.

MANY new measures for the further development of rural industries in Queensland are projected and some are already in the effective stage. Regional experiment stations are in process of establishment in important agricultural centres. At the old-established station at Biloela activities are being extended further into the field of general agriculture and it is planned to include facilities for work in animal husbandry, particularly dairying and pig raising.

The departmental property at the Hermitage, near Warwick, has been reopened and there attention will be given to problems of wheat, grain sorghum, and maize production. Experimental work on soil conservation methods will be done, and pasture plants also will be under trial. All these lines of investigation should be of great value eventually to farmers of the Darling Downs and neighbouring districts. It is expected that problems of dairying, piggery management, and lamb raising will likewise be studied at this station. A horticultural experiment station has been established near Nambour, at which problems of fruit production are under investigation.

In the Far North, the departmental property at Kairi, too, will become a centre for general experimental work, particularly on maize, lucerne, and pasture problems. Attention also will be given to various branches of animal husbandry and other matters of especial interest to the farmers of the Atherton Tableland and contiguous territory.

Crops new to Queensland are under investigation. The Director of Agriculture is at present in the United States of America inquiring into various aspects of primary industry, giving special attention to soy bean varieties, their characteristics and cultivation. It is probable that as a result of this mission the soy bean will eventually become an important factor in our agricultural economy.

In view of the large home market for cotton, consideration also is being given to the expansion of acreage under this crop. It is anticipated that the requirements of Australian cotton mills will aggregate not less than 120,000 bales of the raw cotton in the course of the coming year. The extent to which Queensland growers can supply this market is, however, dependent on the degree of financial stability which the Commonwealth is prepared to give this industry.

Through the agency of the Secondary Industries Development Committee in association with the Department of Agriculture and Stock, the Committee of Direction of Fruit Marketing is being strongly supported in the furtherance of a projected modern cannery for the processing of pineapples. On present indications this cannery should be in operation early in 1947 on what is expected to be a record summer pack.

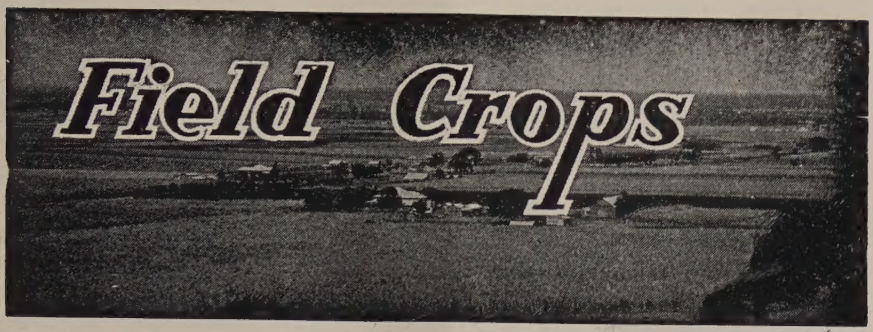
Service to the Dairy Industry.

THROUGHOUT the dairying districts of the State field officers of the Division of Dairying are available to advise dairy farmers on technical and other matters relating to their industry. Emphasis is placed more on advisory and extension service than on routine inspection. Increase in output and the maintenance or improvement of quality standards are the main objectives.

A dairy machinery advisory service is now well established, and field demonstrations and farm visits are arranged according to schedule. The efficient operation and care of milking and separating plants have obviously a direct bearing on the quality of the product. Well equipped laboratories at Brisbane and Toowoomba staffed with highly-trained technologists carry on research, as well as specialized practical work.

A herd-testing service, entirely free to the farmer, is being maintained. Under this departmental system samples are received for determination of butterfat content, records are compiled and results passed on to the farmer. Consideration is being given to the making of this recording system more effective by providing for the setting up of herd testing units consisting of 25 neighbouring farms, and for each unit to have the services of a full-time tester to weigh, sample, test, and compile herd records for the co-operating farmers. To assist in the breeding of better stock by ensuring the availability of an adequate number of pure-bred sires of proven production ancestry, the Department also provides an advanced register testing service for dairy societies without charge to stock breeders. As an added inducement for herd improvement, buyers of pure-bred bulls are allowed rail transport rebates. Taking a long view, the Department initiated a scheme some time ago for the purchase of young dairy cattle for the stocking of dairy farms taken up by ex-Servicemen who are thus assured of the availability of sound foundation stock.

A strongly-staffed veterinary service is being built up by the Department. The Division of Animal Industry provides for research work as well as for practical field service to stockowners throughout the State. Boundaries of five divisions have been fixed, each in charge of a divisional veterinary officer who, through his district officers, controls the activities of the field staff—veterinary officers, advisers, and inspectors—within the divisional area. All matters pertaining to animal health, husbandry, and breeding come within the scope of the departmental services to the agricultural and pastoral industries.



Grazing Winter Cereals on the Darling Downs.

C. S. CLYDESDALE, Senior Adviser in Agriculture.

THE permanent pastures on the Darling Downs, whether they are native grasses or introduced species such as Rhodes grass, mature in late summer and have a very low feeding value during the winter and spring months. There is little prospect of improving the position to the extent of establishing permanent pastures capable of providing nutritious grazing during the winter and spring. This is so, because the rainfall between April and the end of September is usually insufficient to maintain pastures in production, and no extensive irrigation is possible. Under the circumstances, stock owners must rely on annual crops for winter grazing and these crops are usually reliable if sown on land which has been prepared early and carefully. Wheat, oats, canary seed, barley and rye are popular crops for winter grazing on the Downs. In many cases such crops are sown solely for grazing, but in addition, a good deal of pasturage is provided by early grazing of crops which are intended for grain—the latter is common practice, particularly with wheat and canary seed.

WHEAT.

This is one of the most popular cereals for winter grazing on the Downs. It is extremely palatable and highly nutritious and grows very well in a normal season on most of the local soils.

There are three methods of using wheat for grazing purposes:—

(1) Grazing back a crop which is growing too rapidly and so likely to lodge or be injured by frost.

(2) Grazing only in the early stages of growth—the crop being planted primarily for grain.

(3) Grazing at intervals throughout the whole of the growing period.

Preparation of Soil.

Land intended for sowing to wheat for grazing should receive the the same treatment as that necessary for land on which it is intended to grow grain only. A summer fallow is essential in order to conserve much of the summer rainfall, as it is the stored rainfall which normally provides most of the moisture requirements of the wheat crop. The land should be ploughed or sundercut early in the summer to a depth of 3 to 5 inches and allowed to lie in the rough state for a few weeks so that it will break down well on harrowing. Weeds should be destroyed

periodically during the fallowing period by harrowing; this operation will also prevent a hard crust from forming and maintain the desired soil mulch.

The widespread evidence of soil erosion should be sufficient warning to farmers of the danger of using hillsides or other sloping land for winter crops which require a summer fallow.

Suitable Varieties.

When it is intended to plant wheat for grazing only, or for grazing in the early stage of a grain crop, the choice of varieties is limited to those which mature fairly slowly. Such varieties producing large amounts of greenstuff are Cleveland, Currawa, Ford, and Warput. Currawa has been popular as a grazing wheat for many years, but as the grain is subject to dockage because of its low milling quality this variety cannot be recommended for use unless it is to be grown solely for grazing purposes.

Plate 1.
SHEEP ON WHEAT, JIMBOUR PLAIN.

Cleveland is particularly suitable for green feed and grazing on the heavy black soils, such as those of the Pittsworth district. It can be sown as early as the beginning of March. Currawa does best in the higher rainfall areas of the Downs. It also can be sown in March. Ford is satisfactory in a wide range of districts and Warput also is useful in many areas. Both may be sown from April to the middle of May. Where grazing is an important feature on the farm, a succession of plantings from early March to mid-May should be arranged.

Sowing.

Drilling the seed is preferable to broadcast sowing; as it not only makes a good strike more certain but also is more economical of seed. Where 45 lb. of drilled seed will produce a good stand, at least 60 lb. are required if broadcast. About 2 inches is a satisfactory depth at which to plant the seed. With a drill, it is a simple matter to ensure that seed is sown to this depth, but when broadcast seed is harrowed in the depth of soil covering is likely to vary considerably.

Grazing.

On the self-mulching types of Downs soils young wheat plants are easily pulled out by sheep and cattle. Therefore, grazing should not be commenced until the plants are firmly rooted. This will be about six to eight weeks after planting, when the crop is about 6 inches tall. A crop sown for grazing purposes can then be fed off at intervals until September or October.

Stock should not be grazed later than July on crops intended for grain. The time to cease grazing is before the developing heads, which are hidden within the leaves, are high enough from the ground to be eaten off by the stock. This should be checked by examining a number of plants for developing ears. An even grazing of the crop should be effected at each grazing period, otherwise uneven development of the grain crop may occur. A rapid feeding-off with a large number of animals is preferable to an extended grazing by a small herd or flock.

OATS.

This is the most popular winter grazing crop for dairy cattle on the Darling Downs and is used also for sheep and beef cattle. It is grown on a greater diversity of soil types than the other winter cereals. Sown early on well-prepared land, in which adequate moisture has been conserved, this crop produces a very large amount of green fodder and can be grazed up to five times during a season prior to allowing the crop to go for hay or grain.

Preparation of Soil and Sowing.

As for wheat, early preparation of the land for oats is essential and sufficient workings must be given to produce a good tilth. Sowings may be carried out from February to mid-June and the seed is preferably drilled in to a depth of about 2 inches. A useful method to employ when sowing broadcast is to make the final working with a tine cultivator, leaving the surface slightly ridged, and after sowing, run a light harrow across the field, to cover the seed lying in the grooves. A sowing rate of about 40 lb. per acre is used for drilled seed and 60-70 lb. for broadcast seed.

Suitable Varieties.

The dry period usually experienced in early spring is a critical one for the oat crop, most late-maturing varieties suffering severely at this time unless planted very early. Algerian is the most widely used late-maturing variety. It should be sown from February to April and will in normal seasons then provide grazing through the dry spring period. This variety is not particularly palatable and has the additional disadvantage of being fairly susceptible to rust.

Of the early-maturing varieties, Fulghum and Belar are widely used for April to June planting. Fulghum has very marked powers of recovery after grazing and this feature, together with its good tillering ability, makes it an excellent grazing oat. It is, however, commonly rusted. Belar tillers less freely than Fulghum. Various varieties and crosses are now under test on the Darling Downs and promise is shown by some of them.

BARLEY.

The use of barley as a grazing crop should be restricted to the more fertile soils, as the soils of lower fertility will not grow this crop satisfactorily. Early preparation of land is essential for best results and the soil should be well worked to provide a good seedbed.

The main feature of barley for grazing purposes is its ability to produce early feed, but it has a relatively weak root system and is liable to be pulled out by grazing stock. Sown in March or April at the rate of 45-60 lb. per acre drilled and 75 lb. per acre broadcast, varieties such as Cape and Skinless will, under favourable conditions, provide a succession of heavy grazings for several months. If grain is desired, only one or two grazings are permissible.

Plate 2.
SOWN PASTURE, DARLING DOWNS.

RYE.

Rye is used to a small extent for winter and spring grazing on the Downs. It is preferable to the other cereals for the poorer soil types, but here again early and adequate soil preparation is necessary. The sowing rate is from 40 lb. to 60 lb. per acre, according to the method of planting. Should the crop go to seed and the grain become infected with ergots—black, hornlike growths—the stock should be taken off, as these ergots are poisonous.

CANARY SEED.

Although canary seed is usually grown for grain, an appreciable acreage is sown each year for grazing purposes. Like barley, canary seed is fairly readily pulled out by grazing stock. It should be sown only on fertile soils, and for grazing purposes preferably in March or April. When drilled in to a fairly shallow depth, about 8-10 lb. of seed is ample.

Lettuce-growing.*

C. N. MORGAN, Fruit Branch.

LETTUCE during the last few years has become one of the major vegetable crops of districts adjacent to Brisbane. Until recent times the main sources of supply were Chinese market gardens which were chiefly situated in low-lying alluvial ground adjacent to swamps or small creeks near the cities and various large towns.

With the increase in demand, growers with reliable irrigation and with various types of soil experimented with small areas until they found methods and varieties to enable them to produce good quality lettuce all the year round.

The introduction of the Imperial strains of lettuce produced by the late Dr. Jagger of the United States Department of Agriculture has done much to establish the industry in this State. They have shown considerable disease resistance and have stood up to the varying climatic conditions much better than the older varieties. The large well-formed heads of these types are particularly popular on the Queensland market.

Climate and Soil.

Generally speaking, lettuce are grown more successfully during the cooler months of the year, and although affected by heavy frosts this condition is rarely a source of worry in the Queensland lettuce producing districts. Under certain conditions, however, it is grown all the year round, the chief factors in the warmer months being reliable and constant irrigation and the use of a suitable variety. During the summer the plants do not produce a distinct heart as they do in the winter, and although the heads are large they would be classed as loose-leaved. In the warmer weather, unless grown quickly, the lettuce will rapidly run to seed. Almost any well-drained soil, providing it is supplied with adequate moisture and plant food, will grow good lettuce. Different methods of growing may be necessary, such as the hilling up of heavy soils to ensure drainage, particularly during the periods of excessive rains.

Manures and Fertilizers.

As lettuce are heavy feeders it is necessary to ensure that the soil is well supplied with plant food. A number of large growers are fortunate enough to have ample supplies of farmyard manure which is particularly suitable for lettuce and aids in the supply of organic matter without which the growing of lettuce is difficult. Unfortunately, the manure is not available for all growers and therefore the use of commercial fertilizers has become extensive.

*Reprinted from the *Journal* for November, 1943, in response to repeated requests from readers.

The main fertilizer used is blood and bone, which is applied to the ground a week or so prior to planting. Although various methods of application are employed a number of successful growers broadcast the fertilizer and plough or cultivate it in. Where rotary hoes are in use they prove a reliable means of incorporating manure or fertilizer with the soil. Amounts used vary according to soil requirements and usually from ten (10) cwt. to fifteen (15) cwt. per acre has proved sufficient. During growth, top dressing of the growing crop is often necessary and nitrogenous fertilizers are the most satisfactory. Sulphate of ammonia, nirate of soda or dried blood are all used, depending on the grower's particular fancy. Two applications are usually considered necessary, but in some cases one is sufficient when a heavy base dressing of fertilizer or manure has been used. The first top dressing may be done soon after thinning, and the second a little later, when the plants are nearly half grown. Top dressing should not be done when the plants are hearting or in the summer, when nearing maturity, as it tends to produce loose heads. When applying the top dressing the fertilizer should not be allowed to drop on the leaves as it may mark them, and as a precaution after top dressing it is a good practice to water, to wash off any fertilizer that may have fallen on the leaves. The total amount of top dressing should not exceed four hundred (400) lb. per acre.

Following constant use of sulphate of ammonia and manures, liming of the ground is often necessary but should not be overdone. It is commonly considered that large quantities of lime are required for successful lettuce-growing, but on many types of soil, excessive liming is not of any advantage and may even have a retarding action on growth. However, it is necessary on soils with a highly acid reaction, when good results will follow. Certain cases have been encountered where lettuce on soils of high acidity would not grow and showed many stunted and yellow patches, but when grown on the same soil after liming, have shown considerable improvement. A slightly acid soil is probably the best and, therefore, if growers should be doubtful as to their soil condition, a sample should be sent to this Department, where it will be tested for acidity and the correct amount of lime needed to correct any excess will be advised.

Rotation.

Rotating lettuce with other types of vegetables is advised, but due to the position and extent of the most suitable land this is not always possible.

A number of farmers are constantly growing lettuce on the same ground successfully, with no apparent ill effects. In most such instances, however, these growers have available large quantities of farmyard manure which keeps the soil in good condition, replacing in it the materials, particularly organic matter, which are apt to be depleted. In soils that are at all heavy constant watering tends to make the soil organisms inactive, and a rotation with a crop not so exacting in its water requirements allows the soil a chance to dry out partially. Rotation is also advisable to aid efficient control of disease. Green manure crops as a means of improving soil condition are recommended, particularly where growers do not use farmyard manure.

Soil Preparation.

All land for lettuce, whether heavy or of a sandy nature, must be thoroughly prepared. Two, and on certain types of soil three, ploughings are necessary, followed by harrowing and cultivating until such

time as the soil is in a fine state of tilth. The sandy loams are much easier to prepare than the heavy clay loams. When planting direct into the field it is essential to have the land as level as possible and free of lumps, and this can be brought about by the use of a float. This float (Plates 3 and 4) is easily made out of weather boards approximately 3 feet long nailed across two strong supports, the thick portion of the board overlapping the preceding narrow portion about $\frac{3}{4}$ inch. The length of the float may be approximately 4 feet and a chain for pulling attached to the front of the supports so that the thick edges of the planks are drawn against the lumps.

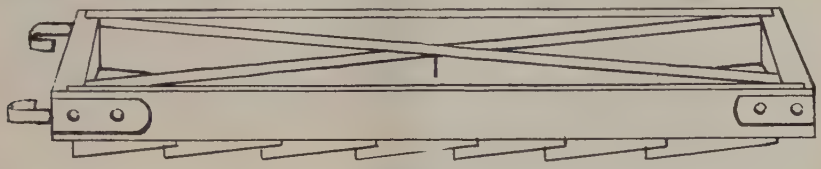


Plate 3.

WOODEN FLOAT.—Note placing of weather boards to act as levellers.

Growers may modify the above sizes to suit their particular requirements. With two horses the size may be increased accordingly and should be sufficiently wide to fill in the hoof marks. Diagonal stays help to make the float more rigid. The driver may stand on the float, supplying any additional weight required.

Planting.

Before the general use of small mechanical seed planters and irrigation, it was customary to grow the lettuce seed in beds and trans-

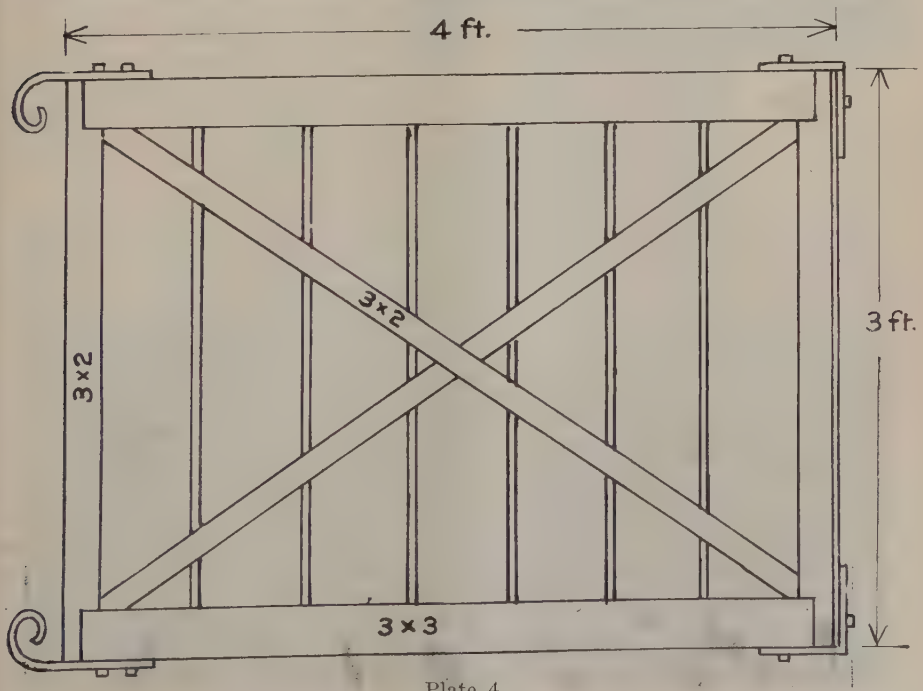


Plate 4.

TOP VIEW OF FLOAT.—Plan showing method of strengthening.

plant to the field. Owing to losses in transplanting and the tedious work this practice has been largely replaced by planting seed direct into the field.

Plate 5.
SCUFFLER WITH "HILLER" ATTACHED TO REAR FOOT.

Plate 6.
"HILLER" FOR ATTACHING TO SCUFFLER.

Two methods of planting are usually adopted. The first is to plant on to raised beds sufficiently wide to allow four rows approximately 12 inches to 15 inches apart. The method of making the beds is to throw in two furrows approximately 6 feet apart, either by means of a single furrow plough or a hiller attached to a cultivator, as illustrated in Plates 5 and 6. The latter method is simpler and quicker. The beds may then be levelled by raking or by a float. The method of raising the beds is employed on heavy or shallow soils to improve the drainage (Plate 7).

The second system is to plant direct in the field without hilling, and is employed on the well-drained sandy types of soil (Plate 8). Rows are made about 15 inches apart, and this distance allows the use of a hand cultivator. Should horse cultivation be contemplated, which is most unlikely, rows will have to be up to 2 feet apart.

Plate 7.
SOIL HILLED UP READY FOR LEVELLING.

Plate 8.

Lettuce Planted on the Flat.—Recommended only for naturally well-drained soils.

With both methods the seed is drilled out so that it is dropped continuously along the row and must be sown shallow. Thick seeding should be avoided as the work involved in thinning is laborious and expensive and much seed is wasted. From 1 to 1½ lb. of good seed should be sufficient to plant an acre when using a planter (Plate 9),

Plate 9.

Mechanical Planter.—Controls distance and depth when planting seed, also marks distance apart of rows with adjustable arm projecting from right of machine.

more being required when planting by hand. If there is any doubt of the seed or conditions affecting germination as much as 2 lb. is not excessive. Successive plantings may be done of areas large enough to conveniently handle at periods of approximately seven days apart. Lettuce usually take from eight to ten weeks from seed to reach market condition, depending on the time of the year and climatic conditions.

Plate 10.

THINNING YOUNG LETTUCE WITH A SMALL HOE.—Notice the unthinned row in the centre.

Thinning.

Approximately three to five weeks after planting, depending on location and time of year, the plants should be large enough to thin out. They are usually thinned to about 9 to 10 inches apart. This can be done by hand or with a small hoe (Plate 10). The latter method is effective, and with practice the grower becomes most skilful. Obviously, with the use of the hoe, many small clumps will be left at each required distance and these may then be thinned by hand. Should there be any misses in the row, they may be filled in by some of the thinned plants.

Cultivation.

Cultivation should be fairly constant and in no instance should weeds be allowed to get too big, as the lettuce is a shallow-rooted plant.

and great injury will result in the removal of big weeds. Small hand cultivators may be used to keep down weeds between the rows. In the rows chipping is necessary; if the lettuce are grown quickly, two chippings should be all that is required. One is usually done at thinning and the other a few weeks later. Cultivation should be fairly continuous, but never too deep. During cultivation is usually a satisfactory time for top dressing as the fertilizer is then worked into the soil.

Plate 11.

Lettuce Half-grown.—Planted 12 inches by 10 inches on raised beds. This area is irrigated with an overhead system.

Irrigation.

Practically all lettuce are irrigated by overhead sprays, and this method is quite satisfactory (Plate 11). If the ground is fairly dry it is advisable to water well a few days prior to sowing. After sowing, the ground should again be watered and then kept moist until the plants are through. Lettuce requires a plentiful supply of water, particularly during the warmer months, when evaporation and transpiration are high. Lack of moisture results in stunting and slow growth of the plants, and in the warmer weather causes them to run to seed prematurely. Soil and climatic conditions have a bearing on any set programmes of watering, and therefore no hard and fast rule can be laid down to cover the various types of soils, but all must be kept moist by regular waterings.

Saturation of soils is undesirable and should be carefully avoided, as far as practicable. This condition often occurs during the rainy periods and irrigation must be carefully planned in an endeavour to avoid watering heavily when heavy rain is likely. During the winter months irrigation is done sparingly, and normally no great effort on the part of the grower is required to keep an even supply of soil moisture during this period. In the summer, however, the position is quite different, and full use of irrigation facilities is necessary.

The well-drained sandy and volcanic soils require much more irrigating than the heavier ones. With the former types it will commonly be necessary to water thoroughly every second or third day. When the longer interval is employed, it will be to advantage to give light waterings in between to keep the soil in as cool a condition as possible. On the heavy soils, one good watering, followed by two light waterings each week should be sufficient. Modifications of any programme may be necessary, of course, with any sudden change in climatic conditions, and growers should not blindly follow any particular practice merely because good results followed it in a former season.

Over head watering during the heat of the day is not recommended and it should be done early in the morning or at night. As the heads reach maturity and the plants spread between the rows they shade the ground and thereby lessen evaporation, with the result that they are not in need of such consistent watering as they were in their earlier stages. Therefore, should a grower find his irrigation supply likely to be slightly below his requirements, losses will be far less probable in lessening the water on the near-mature plants than half-grown ones.

Plate 12.
LETTUCE READY TO HARVEST.

Harvesting.

Lettuce should be harvested as soon as they have reached maturity (Plate 12). If allowed to remain they rapidly become bitter and unpalatable. Winter lettuce are mature when the hearts are firm, and if picked before this do not keep or travel satisfactorily. Summer lettuce, being loose-leaved, may be cut when they reach reasonable market size. In an endeavour to obtain large lettuce in the summer care must be taken to see that they do not start to run to seed, for when this occurs they are commercially valueless. Harvesting extends over a period of days, as it would be a rare case to have all the lettuce from the same planting ready within a day or so of each other. Cutting is done either late in the afternoon of the previous day or early on the

morning of the day of marketing. The former practice is quite satisfactory in the winter, while the latter is more desirable in summer. A pamphlet on lettuce packing for market is procurable on application to this Department.

Varieties.

The most popular varieties are the crisp, curly-leaved lettuce. Various varieties are grown, but the most satisfactory at present are: —

Imperial 847.—This variety is by far the most popular and may be grown in most localities all the year round.

Imperial 615.—This variety is grown to some extent in the winter and is a particularly good lettuce. It is not recommended for the warmer weather.

New York.—This variety is still grown in some localities for the winter, but has been replaced by Imperial 847 for the warmer months.

Seedless.—This variety is popular with a number of growers during the hot months of the year. It is lighter in colour than most of the above varieties but is large and is in good demand.

Mignonette.—A small variety of good flavour, and is recommended for home gardens. It is not a market variety, being too small, but will grow well at any time of the year.

Plate 13.
THE RIVER NEAR JAPOON, NORTH QUEENSLAND.

PLANT PROTECTION

Peanut Crown Rot.

R. B. MORWOOD, Pathologist.

Symptoms.

CROWN rot is a disease which is frequently responsible for poor stands of peanuts, particularly in the Virginia Bunch variety. It causes a wilting of the above-ground parts of the plant accompanied by rotting at ground level. The stalk and root tissues of affected plants, just below the ground, are dark and shrunken and have a somewhat shredded appearance. Frequently, black masses of fungus spores appear on the shredded tissues. Wilted plants subsequently succumb to the disease, and remain in a dry shrivelled condition.

The symptoms resemble those of another peanut disease, namely, wilt, but in this case the roots are intact. It is only on cutting the lower part of the stem that disease symptoms are seen in wilt, when it will be found that there is a brown discolouration of the tissues inside the stem.

White grub injury can also cause a wilting similar to that of crown rot, but this can be recognised by digging up affected plants, when the rather clean cut of the grub can be recognised, and as a general rule the grubs themselves can be found clustered around the roots or near the base of the plant.

Development.

Crown rot is the later stage of seedling blight, which is the more serious phase of the disease. Peanut seed, on germination, is liable to fungus infection. Minute cracks in the skin of the kernel, regarded as normal to shelling operations, form the point at which weakly parasitic fungi enter. Such fungi proceed to cause a rotting of the cotyledon in the presence of moisture.

If these fungi progress rapidly, then the kernel does not germinate or the sprout is killed before it appears above ground. Frequently, however, the infection develops slowly, and only destroys the cotyledon after it has performed its function of nourishing the seedling. However, by gradual spead, it finally reaches the stem of the plant, and may cause its death at any stage up to full maturity. It is this latter collapse which is generally called crown rot. The loss of large plants may be more noticeable than that of seedlings but it is the depletion of stands at an early stage that is the more serious.

The disease is, to a certain extent, dependent on soil conditions. It is aggravated by any check in germination due to such things as unfavourable moisture conditions, poor preparation of the seed-bed, and planting in land which has been under cultivation for some time and which has deteriorated, particularly in physical condition. Peanuts following peanuts in the same soil for a number of years is, as would be expected, particularly liable to result in an increase in crown rot.

Occurrence.

Prior to the general adoption of seed treatment, stands of Virginia Bunch were very badly depleted by this disease. In recent years, as a result of routine application of fungicides to the seed, the incidence has been generally low except when planting has taken place on worn out soil or on non-typical peanut land on the outskirts of the main district. A further exception occurred one season when it was considered that harvesting conditions produced more than usual injury to the kernels.

Apart from these occurrences, in which plant losses have been sufficient to result in a serious reduction in yield, there is usually only a small loss of plants in most crops. The trouble is generally kept at a low level, but not eliminated.

Control.

In the control of the disease, it is essential to avoid any excess injury to the kernels. All machine-shelled kernels are liable to some injury and should be treated with an organic mercury preparation to protect them from fungous infection.

On the Virginia Bunch variety, Ceresan or Agrosan is used at the rate of 1 oz. to 20 lb. of seed. For Red Spanish, the same materials are used, but the rate is 1 oz. to 60 lb. of seed. In Queensland, these measures are in the hands of the Peanut Board, which carries out shelling and treatment and supplies treated kernels to the growers.

Very essential in disease control is the rotation of crops. Rotation with other farm crops, such as maize, grain sorghums, sudan grass, cowpeas, &c., is quite beneficial, but the best system includes a Rhodes grass sward. As a rule, three years of grass should be included in every ten-year period.

Discussion.

The foregoing indicates that the control of crown rot is bound up with general farm practices, most of which are beneficial quite apart from disease control. Such matters as seed selection and adequate cultivation help to maintain the high standard of crops which can be satisfactorily grown in spite of the disease under discussion. The complete elimination of crown rot would be very difficult. The fungi concerned are quite commonly found in the soil and on litter where it is not practicable to deal with them. Once they are inside the tissues of the plant, no external spray will check them, and internal plant treatment is not practicable. Hence, while seed treatment plus good farming will keep crown rot at a minimum, it would appear likely that complete eradication is, in the present state of our knowledge, an unattainable ideal. It is hoped that as increased information becomes available on the disease it may be possible to still further reduce its incidence.

TO SUBSCRIBERS.

Kindly renew your subscription without delay. Write your full name plainly, preferably in block letters.

Address your subscription to the Under Secretary, Department of Agriculture and Stock, Brisbane.

Control of Nematodes in Tobacco Seed-beds.

R. C. CANNON, Assistant Entomologist.

THE root-knot nematode* thrives best in sandy soils under warm climatic conditions and thus has become a major pest in tobacco-growing areas, particularly those of tropical North Queensland. Plants may be attacked at any stage of growth, but the earlier the initial infestation the greater the likelihood of heavy crop losses. For this reason the aim should be to ensure, as far as possible, that seedlings are free of nematodes when planted out in the field, and this calls for particular attention to seed-bed preparation.

The earliest recommendations relating to seed-bed management stressed the need for effective sterilization of the soil with the object of destroying weed seeds, the spores of disease-producing organisms, and the various stages of insect and other pests. In view of the difficulties involved in steam sterilization, heat treatment by burning wood or organic matter from termite (white-ant) nests on the surface of the soil was the method adopted and it soon became standard practice. In the earlier years of tobacco-growing in North Queensland this method proved effective in controlling nematodes, but more recently nematode infestation has been found conspicuous in some seed-beds treated in this manner. Consequently, some farmers began to doubt its efficacy. However, there was also doubt as to the thoroughness with which the operation had been carried out in these cases.

In order to clarify the position and to investigate alternative methods of soil sterilization, a seed-bed experiment was carried out at Mareeba late in 1941. The burning method, using termite nest material, and steaming were compared with a number of chemical treatments and both proved distinctly superior to any of the chemicals tested.† There was little difference between the two methods of heat sterilization and, when the seedlings were examined in the early stages of growth, it was found that less than 4 per cent. of those grown in heat-treated soil had nematodes galls as against 23 per cent. in the untreated soil. In the course of the next few weeks infestation increased to 13 per cent. in the treated soil and 38 per cent in the untreated. It was further noted that the heat treatments promoted vigorous growth and prevented the germination of weed seeds, whereas none of these results were obtained with any of the chemicals tested. Obviously, seedlings from the heat treated beds would have a better chance of normal development in the field.

Pending further investigation of the problem, growers are strongly recommended to disinfect seed-bed soils by the heat method. It has been the general experience that organic matter from termite nests, provided it is reasonably accessible, is preferable to brushwood in that it is more easily handled and burns steadily and uniformly. A day or two before burning the soil should be fairly well prepared and watered. Under these conditions nematodes are more easily killed as a better penetration of heat through the soil can be expected. The fuel should be spread evenly over the surface, including pathways and a margin of 2 or 3 feet around the area. Termite nest material should be applied as a layer at least 4 inches thick, whilst brushwood might be piled several feet high. The latter will burn rather fiercely and rapidly but the termite material

---

* *Heterodera marioni* (Cornu) Goodey.

† Two very promising chemicals—chloropicrin and D-D—were not available for inclusion in the test.

will smoulder for hours, the length of time taken to complete the burn depending on the number of points at which it is ignited. When the ground has cooled the resultant ash should be raked in and the unburnt fragments removed, after which the fertilizer may be applied and the bed prepared for sowing. Since the effect of burning is not permanent there should be no unnecessary delay between the completion of the burn and the sowing of the seed.

It is not claimed that heat treatment by burning will give complete control of nematodes but it is considered that the degree of control to be expected is such as to warrant the time and effort involved. It is suggested that war-time conditions and labour difficulties during recent years may have operated against thoroughness with consequent poor results. It is important that the operation be carried out thoroughly and, in the event of serious failure, a grower would do well to examine his methods.

A POLICY FOR EVERY FARM.

Every farm, even the suburban farmlet, needs a policy. A policy of putting every surplus penny (when there is any surplus) into a sock may be better than no policy at all, but to be constructive, or progressive, we have to look and build ahead.

Take milk production, for example. The drive for more milk must go on, for there will be a world-shortage of food for many years to come and we shall be able to sell all the milk we can put into a vat and every pound of cream we can put into a churn.

There will come a day when milk will be paid for solely on its keeping quality and that will mean strict cleanliness every day in every way in every dairy operation. The sustained emphasis on clean milk has far-reaching implications and its importance can hardly be overstressed.

Full employment has been promised. In this imperfect world it is doubtful if we shall get it; but there will still be more jobs on dairy farms than good men to fill them. Unlimited farm labour is a vain hope, for certain modern trends are making the farm help position more difficult. Without a direct personal interest, there is a growing dislike for milking twice a day and seven days a week.

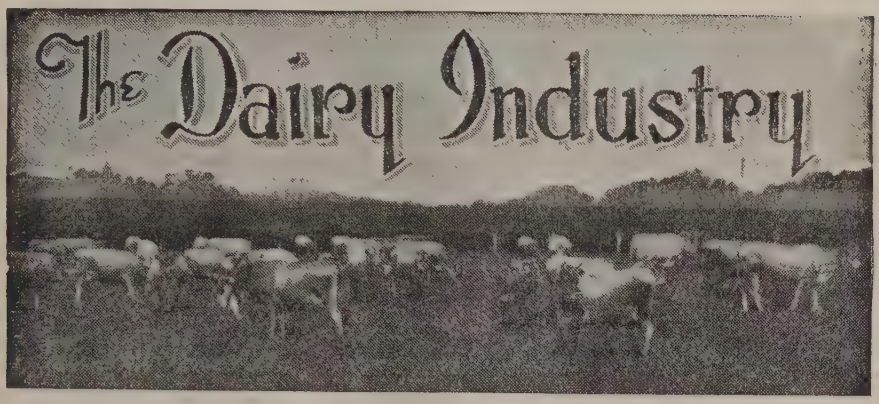
Mechanization is on the march, and with mechanization should be included electrification, as well as power machinery and other modern equipment. Ideas from industrial organisation are taking root, ideas which sound rather mystifying to the ordinary man when expressed in technical terms, but which are actually only technical words for common-sense saving of time, and avoidance of wasteful work. Anyone who works with cows knows that a lot of time and redundant toil can be wasted in ways which could be avoided by better planning of farm layout and equipment. Only the diehard is content to work harder for less reward than, perhaps, his neighbour who is not afraid or suspicious of a new idea—say, of improved breeding and feeding practice, bacteriological control of milk quality (otherwise keeping dirt out of the dairy), maintenance of animal health and so on.

Long-term loans at reasonable interest and a more complete application of the co operative principle would go a long way towards solving some of our rural problems. A system of interest-light loans is, however, merely a suggestion and not a prophecy.

Anyhow, it is believed that any impending change in milk production methods will not affect to any great extent the survival of the small dairy farm of the "farm family" type, provided, of course, that such a farm will continue to be progressive, for there seems to be no reason why modern dairy methods cannot be applied, generally, whether a farm be small or large.

Plate 14.
NORTH QUEENSLAND JUNGLE LANDS, WEST PALMERSTON.

Plate 15.
CLEARING JUNGLE LAND FOR FARMING—A NEW SCRUB "BURN."



Observations on Dairy Manufactures in New Zealand.

E. B. RICE, Director of Dairying.*

AS in Australia, the manufacture of butter is the main use to which the milk produced in New Zealand is put, approximately 75 per cent. being utilised for this purpose. The New Zealand factory butter output is somewhat less than that of Australia, the average yearly production for the five-year period 1939/40-1943/44 being:—New Zealand 150,000 tons, Australia 173,000 tons.

Cheese, of which cheddar is practically the only variety made, ranks second in order of importance of the dairy products manufactured, the comparative average annual productions for New Zealand and Australia for the five-year period mentioned being:—New Zealand 114,000 tons, Australia 32,000 tons.

Other manufactured products are powdered wholemilk, evaporated milk, condensed milk, casein. The needs of the liquid milk market are considerably less than in Australia, as the population of New Zealand is no more than 1,500,000.

The New Zealand Co-operative Dairy Co. is the largest co-operative dairy company in the world. It operates butter, cheese, evaporated milk, condensed milk, powdered milk and milk pasteurising factories. Its production for 1944/45 was 52,000 tons of butter, 18,000 tons of cheese, 11,000 tons of milk powders and 6,000 tons of condensed milk.

In the Dominion the general practice is to fix the rate of payout per lb. butterfat in the dairying season on a conservative basis, with a view to making a substantial deferred payment in July when most suppliers' cream cheques are very low because of the herds being dry at that time.

Shareholding in Co-operative Dairy Associations.

The factories are almost entirely co-operatively owned by the producer-suppliers. The method of financing the establishment of a co-operative dairy company and the allocation of shares to suppliers differs fundamentally from the system in vogue in Queensland. In Queensland, a supplier is required to accept shares in the factory, but it is usually only necessary to apply for a prescribed minimum number

* In an address to Aust. Inst. Dairy Factory Managers, 19th June, 1946.

of shares, say, ten, irrespective of the quantity of milk or cream supplied. In New Zealand, the supplier in almost all co-operative dairy associations is obliged to take out shares in proportion to the amount of produce supplied. For example, the basis of shareholding capital may be one share for every 100 lb. butterfat supplied in the course of the year. If in subsequent years the production of the farm increases above that of the base year, additional shares have to be taken up. The supplier is given a period of years in which to subscribe his share capital; the amount deducted from his monthly pay cheque towards defraying the cost of the shares is usually ¼d. per lb. butterfat supplied.

Voting power for election of co-operative dairy company directorates also is based on the number of shares held by a supplier. No dividends are paid on co-operative dairy associations' shares. Co-operative association legislation also makes provision for associations to take over the shares of any supplier who ceases dairying. Usually the associations pay 75 per cent. of the value of fully-paid up shares so surrendered. In actual practice, the shares are usually taken over by the incoming supplier.

Milk and Cream Transport.

Milk and cream supplies are zoned to factories. Conveyance of milk and cream from the dairy farms to factories is operated either by the co-operative dairy associations with their own trucks, or by contractors. The trucks do not enter the farms to pick up the produce, which is taken by the supplier to the roadside, or, especially in the case of milk, to a dump. These dumps—large wooden platforms—are so situated that no farm is more than one mile away.

In the intensive dairying districts of the North Island, farms are generally in relatively close proximity to factories and are well served by good roads. Despite the moderate climate, cream is delivered daily (including Sunday) to factories in the summer months, and, in fact, most of the year. In the South Island, cream deliveries are usually thrice weekly. The farmers there are usually engaged in other farming activities besides dairying. In specialized dairy districts, cheese production is dominant. For example, in the province of Southland there are 60 cheese factories and only three butter factories.

The average cost of getting cream to the factories is estimated to be about one-third of a penny per lb. butterfat.

Butter and Cheese Quality.

For the year ended 30th June, 1944, the average grade of export butter was 93·359 points. The percentages in the various grades were:—Finest (corresponding with Australian choice) 82·97, first 16·77 and under first 0·25 per cent. The average grade of cheese was 92·076 points. The grading percentages in different grades were:—Finest 22·84, first 72·63 and below first 4·52 per cent.

These creditable results clearly emphasise the necessity for a policy of improvement to be vigorously pursued in Queensland, if our output of dairy produce is to compete on the basis of equality and uniformity on the British market.

Butter Manufacture.

Butter manufacture does not differ markedly from the methods employed in Queensland. It is therefore unnecessary to give details of processing, and reference will be made only to any departure from Queensland practice or equipment.

1. The large output of factories was noticeable. The largest factory in New Zealand, at Rangitaiki Plains, annually produces 5,000 tons of butter. There are 730 suppliers whose farms are mostly within 12 miles of the factory.

2. The basis of payment for cream received differs from that in Queensland. Cream is purchased on its butterfat content in contrast with the Queensland system of payment on estimated commercial butter content.

3. Whereas each delivery of cream to Queensland factories has its fat content determined, the New Zealand factories take a composite sample over a ten-day period for the determination of the fat content.

4. Butterfat contents of cream are determined by the more accurate weighing method, and not volumetrically as in Queensland. A tester can handle about 225 samples a day by the weighing method.

5. The New Zealand regulations prescribe that any cream of sub-standard test (less than 35 per cent. butterfat) shall be subject to a deduction of ½d. per lb. butterfat.

6. Booking-up of cream supplies on the factory platform is efficiently performed. Most factories have installed a type of calculating machine specially designed for use in butter factories. This has facilitated the work of sending out dockets to suppliers.

7. Because of daily delivery, cream supplies to North Island factories arrive at the factory with low acidity (·12 to ·16 per cent.). In processing, the range to which the acidity was reduced was ·06 to ·08.

8. "Straight-through" can washers are chiefly used, in contrast with the Australian rotary washer.

9. Cream holding vats are usually of greater capacity than those favoured in Australia and combined with the larger churns these vats economise in factory space.

10. About 80 per cent. of the butter is produced from cream treated by vacreation. Most factories in the Auckland province, in which feedy cream flavours are pronounced, double vacreate the cream.

11. Churns are usually larger than in Australia. The 100-box churn finds favour in large factories, but factory operatives expressed preference for 65-box churns.

12. A salt crusher to grind the salt used for buttermaking to a fine state is used in most factories. This equipment would be a desirable introduction to Queensland factories. It eliminates hand sieving, reduces labour and makes the salt more suitable for incorporation in the butter.

13. Moisture and salt contents of butter are well controlled. The objective is to churn butter of 15·8 per cent. moisture content and about 1·4 per cent. salt content.

The New Zealand regulations prescribe a minimum and maximum salt percentage. The maximum permissible is 2·0 per cent. with a minimum of 1 per cent. from July to November, and 1·25 from December to June.

The general average composition of butter would be water 15·7 per cent., salt 1·4 per cent., curd 0·9 per cent., fat 82·0 per cent. This reflects well controlled temperatures and efficient workmanship.

14. The New Zealand butter box, or fibre container, differs in shape from the standard Australian butterbox. It contains 56 lb. butter, as in Australia, but is of oblong sides with square ends in comparison with the Australian cube-shaped box.

15. Coal is used in all factories for fuel. Automatic mechanical stokers are commonly used in factory boiler houses.

16. Factory buildings are of variable structural standards. Taken as a whole, Queensland factories lose nothing by comparison.

Cheese Manufacture.

The production figures already quoted show that cheese production in New Zealand is more than three times that of Australia.

The cheesemaking procedure is similar to that in Queensland, with only slight modifications influenced by soil and climatic factors. Cheese factory suppliers mostly deliver the milk themselves to the factory—contract cartage by milk carriers is not done to any extent. The whey is taken back by farmers for feeding pigs, though in the South Island many factories do not return whey. It is usually collected from a number of factories and conveyed to a central plant for conversion into lactose, or a stock food called milky whey paste, and factories for manufacturing penicillin from whey are under construction.

Other observations include:—

1. Cream separators are not permitted in cheese factories and even the starter milk is not separated.

2. The whey is usually separated to recover its fat content. The recovered fat is manufactured into whey butter. The yield of whey butter is approximately one box (56 lb.) to each ton of cheese made. The return from whey butter approximately pays the whole cost of employees' wages. For example, one association operating a number of cheese factories had a wages account for the year of £20,000 and the return from whey cream was £19,000.

3. The grading of milk and payment of differential prices for bacteriological quality is compulsory. The differential is ½d. per lb. butterfat less for milk below first grade. The methylene blue, New Zealand curd and "senses" tests are used for this grading. Milk which is decolourised in the methylene blue test in less than two hours is classified below first grade. The methylene blue and curd tests are usually combined, giving what is known as the New Zealand curd test. A special machine made by a New Zealand firm is used for carrying out the test. Apart from the methylene blue test, the curd is examined after six hours by a "senses" test—smell, taste and appearance—and if considered below first grade, the milk is degraded, even if the methylene blue test exceeds two hours.

4. Milk is supplied in 20- or 25-gallons straight-sided cylindrical cans.

5. Labour in factories is usually one man per vat, plus the manager. In large factories a fireman is employed to care for the boiler and accessories, and if whey butter is made at a large cheese factory a buttermaker also is employed.

6. Pasteurization is practised in almost every factory. The plate heat exchanger type of pasteurizer is displacing the regenerative dome-

type pasteurizer. Pasteurization temperatures for cheese milk are usually about 150-155 degrees Fahr. Higher temperatures favour open-bodied cheese.

7. Single strain "starters" of lactic acid streptococci, prepared and distributed by the Dairy Research Institute, are used throughout the cheese factories. They aid in standardizing manufacture more than a mixed culture. A problem associated with single strain starters is the retention of their active acid production during the manufacturing process, as they are subject to infection with bacteriophage. Phage-infected starters become "slow" in acid development and, in extreme cases, fail completely.

The Dairy Research Institute has studied this problem over many years and has shown that bacteriophage is spread by the "mist" which is always present in a factory during the separation of whey. It may become established in the cheesemaking vats and other equipment and may be in the farmers' cans for taking whey from the factory to the farm.

Recommendations now made for the control of the incidence of bacteriophage involve:—

(*a*) The propagation of starter in an isolated starter room. If this is not provided, it is advised to keep the starter in a room which does not allow of direct access from the cheese-making room.

(*b*) The provision of "water-sealed" lids for the bulk starter cans. The bulk starter heating compartment is fitted with a close-fitting hood.

(*c*) The provision of a pipe let through the factory roof and ceiling into the cover of the bulk starter cabinet. Cotton wool is packed in a container fitted to the end of this pipe outside the factory to filter air drawn through the pipe during the cooling of the bulk starter milk. The outside air thus drawn into the starter cabinet is less likely to be infected with phage than air from inside the factory and the filtration is a further precaution.

(*d*) Daily rotation of starters, using at least four separate strains, for each of which there is a specific bacteriophage which attacks it only and not the other starters propagated. By using each day a different starter strain, the phage for which does not attack the other strains, building up of bacteriophage from day to day, as would occur if only one single strain starter were used, is minimised.

8. Mechanical curd agitators, of the fixed overhead type used in many Queensland cheese factories, also are used in New Zealand, but other types also are used. In one type the agitators travel up and down the vat lengthwise, the agitator itself being of spade-like construction. It was claimed by the cheesemakers to give better "cooking" of the curd and minimises the aggregation of the curd pieces in the corners of the vat. Another kind of agitator of New Zealand manufacture travels round the vat.

9. When running off the whey, many factories insert in the vat a V-shaped "gate" to facilitate rapid removal of the whey. This device consists of two pieces of hinged stainless steel each 4 ft. 6 in. long, 10 in. deep, with 10 rows of holes.

10. The McEwan electric curd mill, made in New Zealand, is used for milling the curd. Similar mills are used in some Queensland factories.

11. Another aid to mechanization of cheesemaking observed was a curd fork. This is operated from the overhead mechanism installed for the ordinary curd agitators used in "cooking." This curd fork is used for stirring the curd after milling. The forks, which travel up and down the vat lengthwise, eliminate manual stirring. It is, however, still necessary, from time to time, to throw the curd which collects along the sides of the vat into the centre in order to ensure even stirring of all curd.

12. The rimless cheese moulds used in Australia are not used in New Zealand. The moulds used give a small crown, but the *Dairy Act* prescribes this shall not exceed $\frac{3}{8}$ inch. A better finished cheese results from the Australian rimless mould. Curd is not weighed before being filled into the hoops.

13. Hydraulic cheese presses are used in many factories. The pressure applied is 200 lb. per square inch, but as friction between the sections of the cheese moulds results in a loss of 40 per cent. of efficiency, the actual pressure exerted on the cheese is 120 lb. per square inch. Pressure in the ordinary horizontal screw cheese press is about 80 lb. at the start, but this decreases as the whey exudes. The higher pressure attainable, with a hydraulic press, is considered to give a closer bodied cheese, with less possibility of mechanical openness.

14. Although atmospheric temperatures are much lower than in Queensland, many factories are equipped with air conditioning plants for the control of temperature and humidity of cheese-holding rooms. The regulations require cheese to be held at the factory for 14 days before despatch to cold stores.

15. Cheese held in cold stores at ports awaiting shipment is stored within the temperature range of 42-45 degrees Fahr. from August to December and 47-49 degrees Fahr. between January and July. The relative humidity of the cold store is maintained at 84 per cent.

16. Typical yields of cheese were:—

	Lb. milk to lb. cheese.	Lb. Cheese to lb. fat.	Av. Test.	Whey Recovery.
New Zealand ..	8·64	2·50	4·62	6·07
Queensland ..	9·72	2·75	3·72	—

17. The average analysis of New Zealand cheese (14 days old) is:—moisture 33·5 per cent., fat 37·0 per cent., solids not fat, 29·5 per cent.

Butter and Cheese Grading.

All dairy produce is subject to grading by officers of the Department of Agriculture and, in the case of export produce, every churning of butter and vat of cheese is graded. Laboratories for the systematic examination of dairy produce are established at Wellington and Auckland.

The official grading systems in operation in New Zealand and Australia differ somewhat in the characteristics of butter and cheese assessed, the points allotted for specific purposes, and the range of points awarded for the various grades. For instance, the highest quality butter grade is known as finest, in contrast with the term choicest used in the Australian system. Possibly the most pronounced difference is the stress placed on closeness in the grading of cheese in New Zealand, 20 points being allotted for this purpose, as well as 20 points for body.

In actual grading practice in New Zealand, full points are never allotted for body and texture of butter and cheese or closeness of cheese. Half points are also scored as final points in contrast with the Australian system of never giving half points in the total score.

Laboratory Examinations at Grading Ports.

Every churning of butter is examined for its moisture and salt content. These are entered on the grading advice note returned to the factory.

A composite sample of all butter packed in each brand is taken three times monthly and the curd content estimated.

A composite sample consisting of a portion of a plug from each vat of cheese in every consignment from a cheese factory is taken for the estimation of fat content.

One composite sample of cheese is examined monthly for moisture content.

The iron and copper content and pH of samples of butter are also determined regularly with a view to minimising metallic contamination, a cause of deterioration of cold stored butter.

In addition to the chemical analyses, all butters are examined at frequent intervals for bacteriological quality. The factories and the field instructional staff receive copies of all these reports, which are of much assistance in locating any foci of contamination in factories, and in control of composition.

The analytical and bacteriological methods used, and standards applied, were obtained from Dr. Moir, who is in charge of the Dairy Division's laboratories.

School Milk.

A Milk-in-Schools Scheme has been in operation in New Zealand for some years. This provides for every school child receiving free of cost a half-pint bottle of pasteurized milk every school day. Strict control (including laboratory tests) is exercised over the quality of this milk.

Milk in Bread.

It is the customary practice amongst New Zealand bakers to incorporate a proportion of a specially prepared milk powder in bread. There are, however, wide differences in the quantities of milk used by individual bakers, some using up to 6 per cent. Apart from the nutritional value, milk improves other qualities of bread. This potential market would appear to warrant the serious consideration of the Australian dairy industry.

Other Manufactured Products.

Factories engaged in the manufacture of unsweetened evaporated milk, dry milk powders, rennet, casein and processed cheese were visited in the course of the itinerary. Every facility to observe the various processes was freely given in every instance and much valuable technical information was obtained.

Research Applied to Dairy Manufacture.

The Dairy Research Institute carries out research on the manufacturing and related aspects of the dairy industry. The industry, through the Dairy Board, makes an annual contribution towards the cost of maintaining the Institute. In 1943-44 the grant was approximately £7,500. An advisory committee, called the Dairy Research Management Committee, guides the research activities. It comprises:—

Three members appointed by the Dairy Board;
One member appointed by the Research Council;
The chairman of the Research Council;
Director of Dairy Division, Department of Agriculture;
Director of the Export Division, Marketing Department;
One member appointed by the Board of Governors of Massey Agricultural College;
One member appointed by the Factory Managers' Association.

A two-day meeting is held at the Institute every year in May, at which factory managers and first assistants discuss with the Institute staff research work in progress. This is an excellent means of bringing research workers and factory personnel together for discussion of mutual benefit, and of expediting the practical application of research results.

Determination of Salt in Butter.

L. A. BURGESS, A.A.C.I., Dairy Technologist.

IN the buttermaking process it is necessary for the buttermaker to know the salt content of the finished butter as different markets require different salt percentages; there also is a legal maximum percentage which should not be exceeded. Methods which incorporate all the salt which is added to a churn of butter make salt control easy and in such cases there is no real necessity for factory salt tests to be performed, unless the objective is close to the legal maximum.

One such method of buttermaking was given in a previous article*, but such methods are not acceptable to all buttermakers. Some methods used result in an unnecessary waste of salt and are not conducive to accurate salt control; it is necessary for salt tests to be frequently made at the factory if even a reasonable degree of control is desired by these methods.

One method only, of the many available, has been selected for description. It has been chosen because of the similarity in calculation to the acidity test, its simplicity, cheapness, and rapidity, ten minutes being ample time for its performance. It is really an extension of the

* D.A.J. 1946. Vol. 62. Part 3 (March) pp. 151-156.

moisture test, the residue of the 10 grams of butter being used for the determination of salt. If performed as directed the test will give results sufficiently reliable for all factory purposes.

Material Required.

A balance on which exactly 10 grams of butter are weighed for the moisture test is essential. The additional materials required are:—

(1) *Glass Stirring Rods.*—These should be 4 to 5 inches long and three-sixteenths of an inch in diameter. The ends should be smoothed and rounded in a flame.

(2) *Measuring Cylinder.*—100 ml. graduated in 1 ml. divisions.

(3) *Pipette.*—Either a 25 ml., 20 ml., or 17·6 ml. pipette may be used.

(4) *Burette.*—This may be either of 25 ml. or 50 ml. capacity graduated in 0·1 ml. divisions. It must have a glass stop-cock.

(5) *White Titration Vessel.*—A shallow porcelain dish holding about 100 ml., or a shallow white china cup may be used.

(6) *Mixing Vessel.*—This is used to mix the residue from the moisture test and a measured volume of distilled or rain water. A malted milk shaker is quite suitable, but a wide-mouthed bottle with a cork, rubber or glass stopper will also serve. A round rubber heel makes a suitable lid for the moisture test cup, in which case the mixing may be performed therein, and a separate mixing vessel and the glass rods will not be required.

(7) $\frac{N}{23{\cdot}4}$ *Silver Nitrate Solution.*—1 ml. of this solution is equivalent to 0·0025 gram of sodium chloride (salt) and it should therefore be obtained from a reliable chemical supply house or prepared by an experienced analyst. It should be supplied in a brown glass-stoppered bottle and should be kept away from light. The solution should not be allowed to remain in the burette after use, as light causes silver to be precipitated and weakens the solution.

(8) *Potassium Chromate—Solution* (10 per cent.).—This is the indicator solution. Its strength is not very important but it must be prepared with distilled or rain water.

(9) *Distilled (or Rain) Water.*—Natural waters contain salt in varying amounts and should not be used.

Procedure.

Weigh out 10 grams of butter and perform the moisture test. Warm a quantity of the distilled or rain water to a temperature of about 120 deg. Fahr.

In the measuring cylinder, measure out the quantity of warm water shown below.

If a 17·6 ml. pipette is to be used— 70 ml. of water.
If a 20 ml. pipette is to be used— 80 ml. of water.
If a 25 ml. pipette is to be used—100 ml. of water.

(It should be noted that the volume of water required is four times the capacity of the pipette.)

If a close-fitting lid for the moisture test cup is available, the whole of the measured volume of water may be added direct to the butter residue and the mixing performed at once in the cup.

If such a lid is not available proceed as follows: —

Add about a quarter of the measured volume of water to the residue of the 10 grams of butter in the moisture test cup and stir thoroughly with a glass rod.

Pour the liquid into the mixing vessel.

Add a further 20 to 25 ml. of the water to the cup and stir again.

Pour this liquid also into the mixing vessel.

Repeat the addition of water to the moisture test cup, stirring and pouring into the mixing vessel until all the water has been used and all the remains of the butter have been transferred, but in no case use more than the quantity of water originally measured out. The water must be warm enough to keep the fat in a melted condition.

Mix the liquid in the mixing vessel by very vigorous shaking. It is essential that the mixing be vigorous as the fatty coating on the solid material must be destroyed in order that the water may dissolve the salt.

Allow to stand undisturbed for 2 to 5 minutes so that the fat may rise to the surface.

Insert the tip of the pipette below the fat layer and fill from the lower water layer by suction. Adjust the bottom of the meniscus to the graduation mark on the pipette and allow the contents of the pipette to run into the titration vessel.

Add four to six drops of potassium chromate solution to the liquid in the titration vessel.

From the burette allow the silver nitrate solution to run into the titration vessel and stir with a glass rod. The formation of a reddish colour marks the end of the titration.

To obtain the percentage, read off the number of millilitres of the silver nitrate solution used and divide by ten.

Example.—A titration of 14·2 ml. shows the salt to be 1·42 per cent.

Theory of the Test.

During the titration a white precipitate of silver chloride is first formed by interaction of the salt and silver nitrate.

$$NaCl + AgNO_3 \longrightarrow AgCl + NaNO_3$$

Sodium Chloride	+	Silver Nitrate	forms	Silver Chloride	+	Sodium Nitrate

As soon as all the sodium chloride has reacted in this way, the excess silver nitrate reacts with the potassium chromate forming silver chromate (which is an intense red colour), and potassium nitrate. The formation of red silver chromate thus serves to mark the end of the titration.

Water on the Dairy Farm.

D. S. ROBERTSON, Dairy Officer.

AN adequate supply of clean, fresh water to keep animals supplied with all the water they can drink and for cleansing operations in the dairy is essential on every dairy farm.

Generally, Queensland subterranean waters are highly mineralized and need treatment before they are suitable for washing milking machines and dairy utensils. Hence it is the practice, on most dairy farms, to have one water supply for the stock and another for use at the dairy.

Water for Stock.

The necessity for an adequate supply of water for the dairy herd is apparent when it is realised that milk contains approximately 87 per cent. water. The daily intake of water by a dairy cow is

Plate 16.

Dam on Monto Dairy Farm.—On the property of Mr. C. Luthje, a four-wire fence prevents stock from gaining direct access to water.

governed mainly by temperature, milk yield, and the nature of available food. It is estimated 3 to 4 gallons are needed for each gallon of milk produced. Cows in milk will thus require 12 to 15 gallons daily and even more in the case of heavy milkers. Green pasture consists of up to 80 per cent. water, but the cow must receive additional amounts of water beyond that obtainable from the pastures, especially when the pastures are drying off. Milk production is often limited simply because the cows cannot conveniently get enough good water. Therefore, at all times, water should be freely available to the animals. This water supply may be one of three kinds, viz.:—(*a*) wells or bores; (*b*) creeks or rivers; (*c*) dams.

Water from Wells or Bores.

The water from wells and bores, being usually clean and fresh, needs only to be pumped into a storage tank, from which it can be supplied to

a drinking trough. Ground waters, however, often contain an excess of salts which are injurious to the health of stock, so that a sample of at least one pint in volume (an ordinary beer bottle) should be sent to the Agricultural Chemist of the Department for analysis and advice. The bottle should be labelled, giving full particulars of source of supply and other circumstances, also the name and address of the sender.

The water trough should be cleaned out regularly, in order that no heavy deposit of green slime accumulates on the water and the sides of the trough. The site of the trough should be carefully selected, an adequate slope in all directions away from the trough being necessary, so that water does not accumulate around the drinking site and form a bog. During dry weather a green slime may form on the surface of well water, in which case it is necessary to immerse the pump in the water to a depth sufficient to avoid pumping up particles of this slime.

Plate 17.

CONCRETE WATER TROUGHS ON MR. C. LUTHJE'S FARM NEAR MONTO.—Water supply for these troughs is siphoned from the dam shown in Plate 16.

Water from Creeks and Rivers.

Water from creeks and rivers may be either running or still.

Running water is generally preferable to still water as the latter may become stagnant. In either case, it is unwise to allow the cattle to wade into the water to drink. The best method of using such a water supply is to pump the water from the creek or river to a storage tank on the bank and then run the water into a trough. In some cases, where a stream is running constantly and the approaches to the water's edge are gravelly or sandy, cattle may be allowed to drink directly from the stream, but in some districts such a water course is the exception rather than the rule, and if its banks are composed of friable soil the cattle will erode the banks and cause the approach to the water's edge to become boggy. Moreover, as the ropy bacteria of milk and cream are found in stagnant water, cattle should be excluded from such pools. When the cows wade into the water these particular bacteria become attached to

the udder and flanks and may fall into the milk bucket during milking. To avoid this risk, cattle should be watered from a trough rather than from the stream.

Water from Dams.

There are dams in many districts, but more could be fitted with an adequate silt trap, fenced off, and the water pumped into a tank and run into a trough. Where it is possible to syphon the water from the dam to the trough, it is not necessary to provide a storage tank if the trough is fitted with a self-regulating float (see Plates 16 and 17). Again, as with creeks, the dam should be fenced off and the water pumped or syphoned to a site remote from the main supply.

Water for stock can be kept clean and cool if the troughs are regularly cleaned out and shaded from the direct rays of the sun, especially during hot weather.

Plate 18.

Well Constructed, Reinforced Concrete, Partly Underground Tanks on Farm near Monto.—Each of these tanks on Mr. C. Luthje's holding has a capacity of approximately 3,500 gallons.

Water for Cleansing in the Dairy.

Clean, soft water is necessary for washing milking machines and dairy utensils, and this is nearly always supplied in the form of rain water, the storage tanks being situated at the milking shed. To be successful, such a water supply should be protected from contamination by dust, manure particles, and bird droppings which float in the air or lodge on the roof of the milking shed. Dust-proof covers and filters fitted to the inlets of the tanks will keep out dust and foreign matter. While rain water is usually stored in galvanised iron tanks, concrete underground tanks are very satisfactory, if correctly constructed and reinforced (see Plate 18). Such tanks should be fitted with a pump to draw the water to the surface. Concrete underground tanks, if properly enclosed and protected, will keep water clean and cool. They are economical to build and, unlike iron tanks, will not rust.

The one constant defect with a rain water supply at the milking shed is inadequate storage capacity. Most milking sheds are provided with either a 1,000- or a 2,000-gallon tank, a capacity insufficient to tide over the long dry spells experienced often in dairying districts. Four thousand gallons of rain water should be considered the absolute minimum on any dairy farm, and if this supply is drawn on for washing out the bails and separator room, 6,000 gallons would not be too much to store. Such an amount could be conveniently collected in one 2,000-gallon galvanised iron tank, and one 4,000-gallon underground concrete tank, the latter being provided to catch the overflow of the first storage tank.

Plate 19.

A 12-GALLON COPPER, BRICKED IN AND SHELTERED FROM THE WEATHER.—Note the lid on the copper. Photo. taken at C. Luthje's farm, Monto.

The Dairy Hot-Water System.

The usual hot water system on a dairy farm may be one or other of the following:—

(*a*) A bucket of water heated on the kitchen stove and carried to the bails;

(*b*) A kerosene tin of water heated on an open fire at the dairy;

(*c*) A 12-gallon boiler situated at a convenient distance from the wash-up trough;

(*d*) A steam sterilizer; or

(*e*) An electric water heater.

Methods (*a*) and (*b*) are strongly condemned as the volume of water is insufficient for the work and the water is never boiling when it is used at the bails. Of the remaining alternatives (*d*) and (*e*) are the most efficient. The former not only provides a sufficiency of boiling water, but it also enables the dairy farmer to steam out his plant and so kill all harmful bacteria which may be present. It should be clearly understood, however, that sterilization does not allow one to neglect any part

of the preliminary cleansing, for should live steam be applied to pipes or utensils from which all traces of milk have not been completely removed, the steam will only bake the milk casein on to the metal and this casein, besides being very difficult to remove, also acts as an ideal breeding-ground for bacteria.

If the farmer is using a 12-gallon copper for boiling his washing water, he would be well advised to build a brick or cement stand for the container, and, for the comfort of the dairy hands in wet weather, to house it in a galley adjacent to the milking shed (see Plate 19). If he does this he will find that such a stand will outlast a cast-iron stand, and that the water will boil with less fuel than would otherwise be used. However, the farmer should always remember that no matter how elaborate or expensive his hot water unit may be, it will fail in its purpose if the unit does not provide sufficient water at a temperature of 212 degrees F.

WATER CONSERVATION.

In the last annual report of the Irrigation and Water Conservation Branch of the Department of Public Lands details were given of completed water storage projects along the Lockyer and of other similar works in progress, in prospect, or under consideration in various parts of the State. These include studies of the water storage possibilities in the Albert, Burdekin, Bremer, Condamine, Dumaresq, Mary, McIntyre, Nogoa, Pioneer and Walsh Rivers; Canungra, Granite, Molongle, Reynolds, Sandy (near Warwick), Waterfall and Waterview Creeks. Additional surveys and investigations in relation to the development and use of underground water supplies in the Lockyer and Bremer Valleys have been carried out. Similar work is proceeding in the valleys of the Don and Dee, south of Rockhampton; and a commission of inquiry is now engaged on the investigation of possible weir sites on the upper and lower reaches of the Boyne River in the Gladstone district.

Plate 20.
BUNGIL BAY, NORTH QUEENSLAND.

Mortality in Pigs.

F. BOSTOCK, Officer in Charge, Pig Branch.

PIG litter losses may occur from one or more of the following causes:—Stillborn, overlying, scours, runts, insufficient milk production of sows, pneumonia and colds, parasites, savage sows and accidents. A very large proportion of deaths from these causes can be attributed primarily to faulty feeding, bad management, poor housing and living conditions. All are within the power of the farmer to rectify, and were these matters given more consideration and thought, the lowering of production costs and more economical operation of the piggery would result.

The average sow is prolific enough, and while the use of prolific sows is essential to profitable pig production, it is considered that better methods of management, feeding and housing are more important than merely increasing litter numbers. From figures made available recently, it has been shown that only 5.27 pigs from every litter born survive and are sent to market. This figure is low and represents a large percentage of mortality in pigs, which could be greatly reduced were more attention given to housing, grazing range, better rations and feeding methods. Therefore farmers are urged to make a thorough overhaul of their pig section, together with the introduction of better feeding methods.

The pig, at one time, in its natural surroundings, lived on foods such as roots, grass, nuts, fallen fruit, and earthy substances, but took a considerable time to reach maturity. It is not so very long ago that a pig required 10 to 12 months to reach bacon weight, but under improved breeding and feeding this time has been reduced to six or seven months. Such rate of growth is remarkable and is found in no other farm animal, yet there are farmers who expect to obtain this rapid growth without giving the necessary attention to feeding and other essentials in successful piggery management.

The pig, it would seem, is regarded as a machine by which so many pounds of food may be economically converted into so many pounds of meat suitable for human consumption. The necessity for careful management, feeding and an understanding of the pig's requirements, is, therefore, obvious.

Cleanliness is one of the first principles in profitable pig raising. A clean pig in a clean sty will respond more rapidly to good feeding than a dirty pig in a dirty sty; also dirty sties and yards harbour disease. Land on which pigs have been allowed to run continuously becomes pig sick after a time and pigs will not thrive on it, and may become infested with parasites which cause unthriftiness, in some cases even death.

Therefore, it is advisable to see not only that the pens are kept clean, but that yards and paddocks in which a number of pigs have been running for some time are ploughed and limed at least every three or four years.

Some of the advantages of the outdoor or grazing system of pig raising are:—

1. Pigs live under more or less natural conditions.
2. From the soil and grass, pigs are able to obtain substances which are essential for their health and proper development.
3. Exercise helps to build up healthy constitutions.
4. Pigs benefit from the health giving rays of the sun, which besides ensuring the full use of minerals obtained from the soil, also enable pigs to store up vitality.

POINTS IN PIGGERY MANAGEMENT.

The feeding of pigs in mud holes is unpleasant, unhealthy, and a wasteful practice. Much of the food is trampled in the mud, instead of going into the growth and development of the pigs. The cost of providing feeding floors would be easily compensated for by the amount of feed saved, and in the improved health of the pigs. These floors should be so constructed as to be easily kept clean and sanitary, thus reducing the incidence of disease or worm infestation, and making the job of feeding in wet weather much more pleasant. It is advisable also to see to the drainage from the piggery and have all mud holes and wallows filled in. wet, sloppy yards make pigs uncomfortable, especially in wintry weather, and consequently more or less unthrifty. Sheds should be inspected, and any cracks in the lower walls or floors covered, while attention should be given to loose wires, posts and holes in the fences.

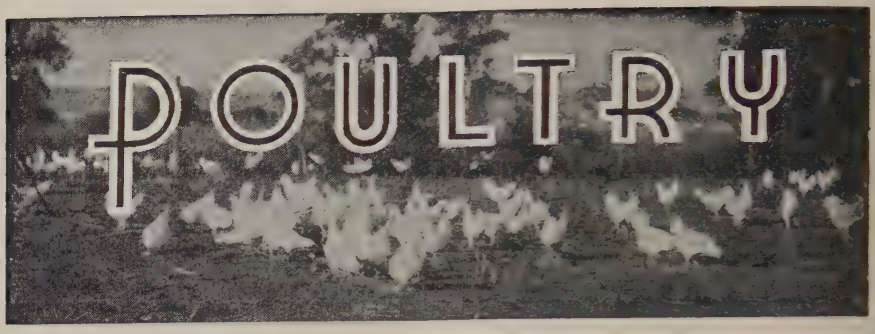
Although much of this labour may appear, on the surface, unnecessary, it should be realized that the object in view is to ensure comfort and warmth, conditions necessary if pigs are to maintain growth, and remain healthy.

A common fault in piggery management is to permit small and large pigs to feed together. A careful grading of the pigs at feeding time and more especially during winter is of great importance, as it gives every pig an opportunity of getting its proper share of food.

A cold, uncomfortable pig never utilizes its food to the best advantage. Therefore consideration should be given to the provision of sufficient shelter and room to prevent overcrowding. Good housing gives protection against draughts, and ensures dry and warm sleeping quarters. Usually, pigs fed suitable rations generate enough body heat to keep them comfortable, provided the houses are free from draughts and properly ventilated. Clean dry bedding, frequently renewed, adds greatly to the comfort of the animals.

In winter time particularly, pigs should be given plenty to eat. The quality of the ration is also an important consideratoin, but it is a great mistake to limit the amount of the ration below that necessary to ensure normal growth and contentment.

—F.B.



Sex Determination of Day-old Chickens.

C. MANNING, Poultry Inspector.

IN all branches of poultry raising, economy in production is of utmost importance. The raising of hens for egg production may be done without the presence of roosters on the farm. A farmer rearing fowls for table purposes needs to raise the class of poultry that is in greatest demand. There are times (as during the present period of shortage of feed and materials for housing poultry) when every poultry raiser should be sure that the class of chicken which he is rearing is suitable for the branch of the industry in which he is engaged.

With the production of table poultry, sex linkage of poultry may be practised as a method of the determination of the sex of chickens, as in this case breeds capable of producing cockerels and pullets distinguishable at day-old by their markings may be used. However, table poultry raising in Queensland is not an extensively specialized business, but is conducted more as a sideline to commercial egg production. The White Leghorn and the Australorp, the two main breeds in this State, are not suitable for the production of sex-linked chickens. Therefore, as a method of sex determination, sex-linkage is not practised to any extent.

The determination of the sex of day-old chickens by examination of the rudimentary genital organs was first perfected in Japan in 1927, but it was not until 1933 that it was introduced into other countries. Canada was one of the first to adopt this method. In 1934, a Japanese expert visited Australia and gave demonstrations and instruction. However, because of the fact that food supplies were plentiful, and material for accommodation could be purchased, the need for strictly adhering to one class of poultry raising was not followed and the determination of the sex of day-old chickens did not gain the immediate popularity which it did in other large poultry raising countries.

During the war, the poultry industry expanded both in the production of eggs and table poultry. The present shortage of building material and fodder now make it a necessity for a farmer to raise only the class of poultry for which his farm is established.

The determination of the sex of day-old chickens requires considerable skill. To the average person there is no visual difference between a pullet and a cockerel day-old chicken. Unscrupulous persons took advantage of this fact and sold cockerel day-old chickens to unsuspecting buyers who thought that they would ultimately rear an equal number of pullets and cockerels. With the object of protecting the hatcheryman,

the sexer and the buyer the *Diseases in Poultry Acts* were amended to provide for the licensing of persons competent to determine the sex of day-old chickens and for the branding of chickens determined as cockerels with an indelible stain. This legislation has now been superseded by *The Poultry Industry Act of* 1946, under which new sections have been included providing for the control of sexing and the licensing of persons qualified to determine the sex of day-old chickens.

How the Purchaser is Protected.

It is necessary for all persons practising the determination of the sex of day-old chickens to be licensed and such license is only issued after proof of qualification by examination to determine the sex of day-old chickens has been given. Under the *Poultry Industry Act* it has been provided that licenses shall be of two classes—first and second. A first class license shall only be issued to a person who has gained a 95 per cent. pass or better, in an examination conducted on 200 chickens. However, this degree of accuracy must be obtained in both the cockerels and pullets as classified by the candidate. A second class license may be obtained by gaining a 90 per cent. pass, or better, at an examination on 100 chickens.

All chickens determined as cockerels by a person licensed to determine the sex of day-old chickens must be sprayed by him with an indelible violet spray immediately on sexing. It is an offence under the Act to stain any but cockerel chickens, and should any of a batch of chickens be indelibly stained with a violet stain, then the container holding the chickens must carry a label stating definitely how many of each sex are included in the batch. For all varieties of chickens the violet stain was found most suitable, and although in some instances, such as on black chickens, the stain is not so easily discernible, there are usually patches of white fluff on all chickens on which the stain can be observed, and if there is any doubt by the purchaser as to the sex of a particular lot, the chickens should be carefully examined.

Furthermore, it is now provided under the Act that the vendor must supply a written statement as to the sex of the day-old chickens sold by him. This information may be set out on the receipt, but must definitely state whether the chickens are day-old chickens (that is, chickens of mixed sex), pullet, or cockerel day-old chickens. In the event of either cockerel or pullet day-old chickens being offered for sale, the vendor must also supply the purchaser, on demand, with the name of the person who determined the sex of such chickens.

At the present time, in the case of the sale of pullet day-old chickens, the vendor shall also guarantee that at least 90 per cent. shall be pullet chickens.

The Practice of Sex Determination.

It is not easy to acquire the skill necessary to accurately determine the sex of day-old chickens, and unless one is prepared to devote the time necessary and has the facilities and continuity of the supply of day-old chickens for the purpose of practice, it is not recommended that he may give this work any attention or consideration, as it is more economical to engage the services of a qualified person than to have the work done unsatisfactorily.

Under the *Poultry Industry Act,* it is an offence for any person who is not licensed to engage in this work.

Points in Sex Determination.

For those who wish to make a study of the determination of the sex of day-old chickens it is desired to state some of the essentials for success and the problems which have to be mastered.

To become proficient in the determination of the sex of day-old chickens one must first of all have good eyesight. This is essential because of the minuteness of the genital eminence. A strong light of from 150 to 200 watts at a height convenient to the operator is a necessity. The light, of course, should be shaded so that the rays are directed on to the chickens and do not shine in the operator's eyes. The room in which chickens are sexed should not be well lighted, as it is necessary for the strong artificial light to be concentrated on the chickens.

A careful study has to be made of the genital eminence for, although all males have a genital eminence and half the females have none, the other females have an eminence which may be confused with that of the male. The genital eminence develops in both sexes up to the fourteenth day of incubation, but in the female, after this period, it gradually shrinks, while in the male it remains normal. In the case of some females the shrinkage of the eminence is only partial, and some females therefore have an eminence similar to though smaller than the male. In other females, the rigidity of the eminence abates and the chicken is thus seen with a fairly large fold in the lining membrane which gives the appearance of a large flabby eminence.

Authorities divide the genital eminence in the case of male chickens into six groups, while the females are only grouped into three. Type A of the male constitutes approximately 75 per cent. and types B to F approximately 5 per cent. each of the remainder, type D being the most numerous, constituting, at times, up to about 6½ per cent. Female type A constitutes up to 60 per cent. of the females, and B and D types 37 and 3 per cent. respectively.

Types of Eminences.

Following is a brief description of the various types of males and females:—

Male.

A. Eminence comparatively large and well defined, rising abruptly from the surrounding folds.

B. Much smaller than type A, and yet fairly firm and well defined.

C. Somewhat tongue-shaped and situated nearer the outside of the cloaca than A and B.

D. Consists of a large flattened eminence fused with the surrounding folds.

E. Is elongated and thin and in some cases reaches the first set of folds.

F. Is really a double eminence.

Female.

A. No eminence is present at all in this type.

B. Very much like the male, but the eminence is smaller, and well defined. Situated on the inside of the second fold.

C. Nil.

D. Also resembles the male type, being fairly large, but does not stand so erect from the surrounding folds.

E. Nil.

F. Nil.

Although it is difficult for beginners to differentiate between the female and male eminences, it is possible, after learning how to handle the chick and evert the cloaca, to successfully sex chickens with about 70 per cent. accuracy, since the A type in males and females constitutes about 75 and up to 60 per cent., respectively.

After practice, however, it is possible to distinguish the sexes with a greater degree of accuracy, as the female eminence does not stand out as clear or erect as the male types and is more or less of a flabby nature. By passing the finger across an eminence of a male it will show out much firmer than the eminence of the female, although with the female type B the eminence while tending to flatten enlarges somewhat. However, decisions should be made quickly and if any doubt exists the chicken should be replaced and looked at again a little later.

Post Mortem Examination of Chickens.

Post mortem of doubtful chickens is an advantage, as it is possible by this means to impress on the beginner the variations in types of eminences. Chickens are usually killed for post mortem by pressing the necks against a sharp-edged box or table, although some dislocate their necks by pressure with the thumb nail against the neck of the chicken and the index finger, gently pulling the chicken's body with the other hand.

When the chicken is dead, take the head between the first and second fingers and spread the body across the hand, placing one leg between the thumb and finger and the other between the little and third fingers. Next tear off the skin and fluff, exposing the abdominal wall. The thumb and index finger can then be used to tear the abdominal wall, and by pushing the yolk and intestines to one side the testes or ovary can easily be distinguished lying at the anterior end of the kidneys immediately over the backbone. In the male chick the testes are situated one on either side of the backbone and are small, elongated, bean-shaped organs of a pale yellowish colour. There is only one ovary present in the normal day-old chicken, this being situated on the left side of the body. It is rather a star-shaped body and appears to be embedded in the kidney tissue.

Handling of Chickens.

Unless a person has practised the holding of the chicken and evacuation of the cloacal contents, it is useless proceeding further in the determination of sex.

A person should have nimble fingers and be able to handle chickens expeditiously and carefully in order that they may not be injured in any way. It matters little how the chickens are held provided they are held firmly yet gently, and if the little and third fingers are passed on either side of the neck as a method of holding, care should be exercised not to strangle the chicken.

The cloaca should always be emptied before examination. This is done by applying sudden yet gentle pressure on the abdomen of the chicken. The first two fingers of the free hand, or the index finger and thumb, are then used in conjunction with the thumb of the hand holding the chicken to evert the cloaca and thus expose the genital eminence. However, care should be taken not to exert too great a pressure on the parts, as the intestinal tract may be protruded over the genital eminence, thus making the determination of sex more difficult. The genital eminence is situated on the lower edge of the cloaca.

REGISTERED HATCHERIES

REGISTRATION of poultry hatcheries entails blood testing and the removal of birds found to be affected with pullorum disease, or are otherwise unsuitable for breeding purposes.

Owner.	Name of Hatchery.	Breeds.
V. H. Allen, Oxley road, Oxley	Alaura	White Leghorns, Australorps, Langshans, and Rhode Island Reds
I. M. Armstrong, Randall road, Wynnum West	Chanticleer	Australorps
P. R. Bach, Cleveland		Australorps and White Leghorns
Mrs. E. A. Baltzer, 10 Mary street, Toowoomba		White Leghorns
J. S. Bauer, Oakwood, Bundaberg	Austral	Australorps and White Leghorns
Beach Bros., Wellington Point	Triangle	Australorps and White Leghorns
J. M. Beccaris, Harvey's Range road, Townsville	Brach Bros.	Australorps and White Leghorns
H. Brazil, Beaudesert road, Cooper's Plains	Winova	Australorps, White Leghorns, and Rhode Island Reds
D. L. Burns, Brisbane road, Redcliffe	Brazil's	Australorps and White Leghorns
P. J. C. Bygrave, Robinson road, Aspley	Yalta	White Leghorns and Australorps
M. H. Campbell, Albany Creek, Aspley	Craigan Farm	White Leghorns and Australorps
W. Carr, A. B. and A. T. M. Watson, Logan and Creek roads, Mount Gravatt	Mahaca	White Leghorns and Australorps
	Bellview	Australorps, White Leghorns, Minorcas, and Rhode Island Reds
J. L. Carrick and Son, Manly road, Tingalpa	Craigard	White Leghorns and Australorps
J. E. Caspaney, Kalamia Estate, Ayr	Evlinton	White Leghorns
A. R. Chard, Chard's road, Bundaberg	Sunnyland	Australorps and White and Brown Leghorns
N. Cooper, Zillmere road, Zillmere	Graceville	White Leghorns
R. B. Corbett, Woombye	Labrena	White Leghorns and Australorps
A. Cowley, The Gap	Melody	White Leghorns and Australorps
A. J. Daniels, Moongan	Daniel's	White Leghorns, Australorps, Anconas, Brown Leghorns, and Rhode Island Reds
T. Duval, New Lindum road, Wynnum West		Australorps and White Leghorns
E. Dearling, Haden		White Leghorns and Australorps
V. R. Dearling, 85 Holberton street, Toowoomba		White Leghorns, Australorps, and Brown Leghorns
Dixon Bros., Wondecla	Dixon Bros.	White Leghorns
E. Eckert Head street, Laidley		Australorps, Langshans, and White Leghorns
A. W. Edwards, Stenner street, Middle Ridge		Australorps and White Leghorns
C. L. Eggar, Moggill	Rosehill	Australorps
F. G. Ellis, Old Stanthorpe road, Warwick	Sunny Corner	Australorps
Elks and Sudlow, Beerwah	Woodlands	White Leghorns and Australorps
W. Ellison, junr., Bald Knob, Landsborough	Willeden Plantation	White Leghorns and Australorps
B. E. W. Frederich, Oxley road, Corinda	Glenalbyn	Australorps
N. H. Gibson, Manly road, Tingalpa	Gibson's	Australorps and White Leghorns
Gisler Bros., Wynnum	Gisler Bros.	Australorps and White Leghorns
R. T. Green, 116 North street, Toowoomba		White, Black, and Brown Leghorns, Australorps, and Langshans
W. G. Gregory, Deeragun	Rocks	White Leghorns, Australorps, and Rhode Island Reds
T. L. Griffiths, Margaret street, Silkstone, Ipswich	Hillcrest	White Leghorns and Australorps
J. W. Grigg, Tumoulin		Australorps and White Leghorns
F. P. Grillmeier, Milman	Mountain View	Australorps and Minorcas
T. A. Haggquist, Edmonton	White Rocks	White Leghorns
P. E. and G. G. Hannay, Ridley road, Aspley	Sunnyhill	White Leghorns and Australorps
C. Hartmann, Box 73, Pittsworth	Vigor	Australorps, White and Black Leghorns
P. Haseman, Stanley terrace, Taringa	Black and White	Australorps and White Leghorns
L. G. Higgins, Middle Ridge, Toowoomba		Anconas, Rhode Island Reds, and White Leghorns
F. E. Hills, Sims road, Bundaberg	Littlemore	Australorps, Rhode Island Reds, White Leghorns, White Wyandottes, and Langshans
A. H. Hillenberg, Crow's Nest		Australorps
Hodgen Bros., Spring street, Middle Ridge	Austral	White Leghorns and Australorps
A. E. Hoopert, 24 Greenwattle street, Toowoomba	Kensington	Australorps and Rhode Island Reds
H. Hufschmid, Ellison road, Geebung	Meadowbank	White and Brown Leghorns, Minorcas, Australorps, and Rhode Island Reds

REGISTERED HATCHERIES—*continued.*

Owner.	Name of Hatchery.	Breeds.
Mrs. E. R. Hurren, 44A Herries street, Toowoomba	..	White Leghorns and Australorps
H. Jones, Ridgelands	Jolly Farm	Langshans, Australorps, White Leghorns, White Wyandottes
A. J. F. Jull, Stradmore, Ramsay street, Middle Ridge	Stradmore	White Leghorns
W. Kelly, Parkhurst, via North Rockhampton	..	White Leghorns, Australorps, and Rhode Island Reds
R. H. Kennedy, 357 Bridge street, Toowoomba	..	White Leghorns, Australorps, and Rhode Island Reds
F. E. Kipee, 40 Hurlsey road, Toowoomba ..	..	White Leghorns
E. C. Kolberg, Handford road, Zillmere ..	Gerbera	Australorps
F. Le Breton, Bald Knob, via Landsborough..	Pagoda	White Leghorns
W. A. Lehfeldt, Kalapa	Lehfeldt's	Australorps
W. A. Luke, 108 Russell street, Toowoomba..	Downs	White and Brown Leghorns, Australorps, and Rhode Island Reds
J. McCulloch, White's road, Manly	Hindes	White Leghorns and Australorps
A. Malvine Waterworks road, The Gap ..	Alva	White Leghorns and Australorps
A. Mawhinney, Robinson road, Aspley ..	Aspley	White Leghorns, Australorps, and Rhode Island Reds
Mrs. P. W. E. Maynard, Doonside, via Dalby ..	..	Australorps and White Leghorns
W. S. MacDonald, Babinda	Redbird	Rhode Island Reds and Anconas
F. Maxfield, 60 Holberton street, Toowoomba	Braeside	White Leghorns
C. J. Mengel, New Lindum road, Wynnum West	Mengels	Australorps
F. J. Miller, 305 Bridge street, Toowoomba ..	Rhode Island Red ..	White Leghorns
J. A. Miller, Racecourse road, Charters Towers	Hillview	White Leghorns
H. H. Millman, Haly street, Kingaroy ..	Kingaroy	Australorps, White Leghorns, Wyandottes and Plymouth Rocks
F. S. Morrison, Kenmore	Dunglass	Australorps
C. J. Nielsen, Kensington street, Bundaberg ..	Bona Vista	Australorps, Rhode Island Reds, and White Leghorns
S. V. Norup, Beaudesert road, Cooper's Plains	Norups	White Leghorns and Australorps
H. Obst and Sons, Shepperd	College Holme ..	White Leghorns and Rhode Island Reds
H. W. and C. E. E. Olsen, Marmor	Squaredeal	White, Black, and Brown Leghorns, Anconas, and Australorps
E. E. Palmer, Greenmount	..	Rhode Island Reds
A. C. Pearce, Marlborough	Marlborough ..	Australorps, Rhode Island Reds, Light Sussex, White Wyandottes, Langshans, Khaki Campbell and Runner Ducks, and Bronze Turkeys
W. J. Perkins, 110 Dearling street, Toowoomba	Rhode Island Red ..	Rhode Island Reds
A. J. Philp, Upper Sheridan street, Cairns ..	Aerodrome	White Leghorns, Australorps, Rhode Island Reds, Anconas, and Light Sussex
G. Pitt, Box 132, Bundaberg	Pitts'	White Wyandottes, White and Brown Leghorns, Australorps, Rhode Island Reds, Langshans, and Light Sussex
Mrs. M. Price, care Post Office, Macalister ..	..	Australorps and White Leghorns
F. M. G. Proellocks, 81 Herries street, Toowoomba	Vale View	White Leghorns
J. C. and G. E. Raff, Musgrave road, Sunnybank	Brundholme ..	White Leghorns, Australorps, and Rhode Island Reds
G. R. Rawson and Son, Mains road, Sunnybank	Sunbeam	White Leghorns, Australorps, and Black and Brown Leghorns
C. G. A. Rivers, Tamaree	Tamaree	Rhode Island Reds and White Leghorns
C. Roberts, Trout road, Aspley	..	White Leghorns
J. Rogoff, 423 Logan road, Stone's Corner ..	Kingston road ..	Australorps
C. L. Schlencker, Handford road, Zillmere ..	Windyridge ..	White Leghorns and Australorps
P. H. Scotney, Priest street, Toowoomba ..	..	White Leghorns and Rhode Island Reds
J. Schumann, 291 Bridge street, Toowoomba	..	White and Brown Leghorns, Rhode Island Reds, and Australorps
S. E. Searle, New Cleveland road, Tingalpa ..	Tingalpa	White Leghorns and Australorps
N. G. Seymour, Ipswich road, Darra	Sohufa	White and Black Leghorns and Australorps
R. E. Slaughter, Handford road, Zillmere ..	Monarch	Australorps and White Leghorns
H. A. Springall, Progress street, Tingalpa ..	Springfield	White Leghorns
A. W. Stehn and Son, 285 West street, Toowoomba	Red Spot	Australorps, Rhode Island Reds, White and Brown Leghorns
J. P. Skelly, Helidon	Helidon	Australorps and White Leghorns
W. B. Slawson, Fraser road, Mitchelton ..	..	White Leghorns, Australorps, and Light Breeds
T. Smith, Isis Junction	Fairview	White Leghorns and Australorps
P. W. Stark, Crow's Nest	Austral	Australorps
H. M. Stephens, 160 Barolin street, Bundaberg	Barolin Stud ..	Australorps and White Leghorns
J. Stevenson, Dragon street, South Warwick	Ivanhoe	Rhode Island Reds, White Leghorns, and Australorps

REGISTERED HATCHERIES—*continued.*

Owner.	Name of Hatchery.	Breeds.
R. Stockman, Kairi	Tinaroo	White Leghorns and Rhode Island Reds
A. H. Tebbutt, Stewart terrace, Gympie ..	Delrae	White Leghorns, White Wyandottes, and Australorps
A. G. Tietzel, West street, Aitkenvale, Townsville	Tietzel's	White Leghorns and Australorps
R. M. Thomson, Parkhurst, North Rockhampton	..	Australorps
H. G. Thorpe, Box 36, Goomeri	Thorburn	White Leghorns, Australorps, and Rhode Island Reds
G. L. Vogler and M. E. Hooper, Kenmore ..	Stonehenge	White Leghorns and Australorps
W. Warren, Progress street, Tingalpa ..	..	White Leghorns and Australorps
N. J. Watson, Lister street, Sunnybank ..	Glencoe	Australorps and White Leghorns
Mrs. V. M. White, Archerfield road, Darra ..	Viola	White Leghorns and Australorps
P. A. Willson, Board street, Deagon	Myara	White Leghorns and Australorps
G. A. C. Weaver, Herberton road, Atherton ..	Weaver's	Australorps, White and Brown Leghorns, Anconas, Minorcas, Rhode Island Reds, Indian Game, and Bantams
F. H. J. Weeks, Bajool	Glen Brae	White Leghorns and Australorps
Miss I. G. Winter, 761 Ruthven street, Toowoomba	..	White Leghorns
Miss L. M. Wooller, Huet street, Rockhampton	Riverview	Rhode Island Reds, White Leghorns, and Australorps
P. A. Wright, Laidley	Chillowdeane ..	White and Brown Leghorns and Australorps
A. Wruck, Main road, Upper Brookfield ..	Wrucks	White Leghorns and Australorps

Plate 21.

KAURI LOGS IN A NORTHERN JUNGLE, NEAR DANBULLA, QUEENSLAND.

ANIMAL HEALTH

Blackleg in Cattle.

A. K. SUTHERLAND, Veterinary Officer, Animal Health Station, Yeerongpilly.

BLACKLEG in cattle is known in many countries throughout the world and in Queensland is widely distributed in both the beef and dairy cattle areas. Outbreaks can cause serious mortalities. These losses, however, can be avoided as the disease is not difficult to recognise and can be prevented by vaccination.

Cause.

Blackleg is caused by infection with a bacillus, *Clostridium chauvoei*. This micro-organism produces minute seed-like bodies, known as spores, which are very resistant and can survive in the soil for long periods. The disease is common in some regions and rare or unknown in others, its distribution apparently depending on whether the soil is favourable or otherwise to the survival of the spores.

Infection probably takes place when soil containing spores is swallowed during grazing. The bacillus grows in the muscles and produces a poison which circulates in the blood and soon kills the animal.

Animals Affected.

Blackleg is a disease of calves and weaners. It attacks animals in any condition, but it is often the best conditioned animals which are affected. It is essentially a disease of young cattle and is rarely seen in animals over two years of age. It is not known why young cattle are susceptible to the disease whilst adults are resistant.

Sheep and goats are also susceptible to blackleg due to *Cl. chauvoei*. The disease occurs fairly extensively among sheep in western Queensland. Sheep of all ages may be affected but sheep under 2 tooth are most susceptible. Most of the outbreaks which have come under observation in Queensland to date have been confined to rams. The preventive measures described here for cattle are equally effective in sheep.*

Symptoms.

Blackleg kills very quickly and, as a rule, attention is first drawn to outbreaks by the presence of dead animals. If an animal is seen before death, it is usually isolated from the mob and lame in one or more limbs. Closer examination will generally reveal a swelling of the muscles of some part of the body. If the swelling is pressed it may crackle. The animal is fevered and soon becomes prostrate and dies in a day or so.

Post-mortem Examination.

The carcase of an animal which has died from blackleg becomes very swollen soon after death. However, it should be remembered that in the high temperatures of summer, the carcase may swell rapidly after death, simply as a result of decomposition.

* See this Journal, Vol. 62, Part 1, page 15 (Jan., 1946) for article on blackleg in sheep.

The characteristic feature of blackleg is the rapidly developing swellings which occur in the muscles, usually of the limbs, but sometimes also of the neck, body or cheek. The skin over these swellings may be dry and parchment-like (gangrenous) and, beneath the skin there is usually an accumulation of yellowish and perhaps blood-stained fluid. The affected muscle is swollen and dark with black or blood-stained patches in it. Bubbles of gas may be present in the muscle tissue or in the fatty tissue between the muscles. The diseased area has a rather distinct sour smell, not unlike rancid butter. It is important that the carcase be examined soon after death otherwise changes in the muscles due to putrefaction may be mistaken for blackleg. When blackleg is suspected, the examination should be thorough and all the muscles sliced and inspected.

Other abnormalities which may be present in a case of blackleg are engorgement of the skin and internal organs with dark blood, hæmorrhages of the heart and lungs, a swollen and friable liver and fluid in the chest and abdominal cavities. However such changes may also be found in diseases other than blackleg. There are usually no abnormalities in the spleen and the blood clots normally.

Diagnosis.

When cattle under 18 months of age die suddenly, blackleg should be suspected. It is important that a correct diagnosis be established without delay so that the remaining calves in the mob can be vaccinated to prevent further losses. A post mortem examination should be done as soon as possible after death and the muscles examined for the lesions described above. The nearest Inspector of Stock or Veterinary Officer should be consulted for advice and assistance.

Prevention.

Treatment of animals affected with blackleg is futile, but the disease can be prevented by vaccination. Considerable resistance to blackleg is obtained by inoculation of calves with several products which are on the market. The strongest and most durable immunity is obtained by inoculation with liquid vaccine which is prepared from cultures of the blackleg bacillus. This type of vaccine (referred to in America as a bacterin) contains no live organisms and is therefore quite safe. Fifty doses of the recommended Australian-made vaccine cost 11s. in Brisbane. The various types of aggressins and solid and pellet forms of immunising agents have been superseded by liquid vaccines or bacterins.

When a case of blackleg occurs, every animal under two years of age in the herd should be vaccinated immediately. Immunity takes about 14 days to develop (so deaths may continue up to 14 days after vaccination). On properties where the disease is known to exist calves should be vaccinated annually. Even though no cases have been observed for some time, vaccination should be carried out, because the bacillus can persist in the soil for long periods. Blackleg spores in the soil may eventually die out if all calves are vaccinated every year for a number of years after the last case of blackleg.

The carcases of all animals which have died from blackleg should be completely burnt. The top soil for several feet around the carcase should be shovelled into the fire. Dead animals in which the disease is only suspected should be treated in like manner. These steps are necessary to prevent infection of the soil with blackleg bacilli.

Age to Vaccinate.

On most properties where blackleg vaccination is a routine procedure, the calves are vaccinated at branding time and this usually prevents losses. However, this practice may not be effective in all districts because the age of calf and the season of the year in which blackleg is prevalent, as well as the time of branding, all vary in different parts of the State. When deciding the age and the season at which to vaccinate calves, important facts to remember are—

(*a*) There is no appreciable immunity until 14 days after vaccination.

(*b*) Immunity is strongest three to four weeks after vaccination.

(*c*) Thereafter the immunity gradually becomes weaker so that, even with the best vaccines, animals may be unable to resist natural infection 10 to 12 months after vaccination. Thus calves which are vaccinated when they are six months old or younger may require a second dose of vaccine at 12 months on properties where the disease is prevalent.

Technique of Blackleg Vaccination.

The vaccine is injected subcutaneously (that is, beneath the skin) with a hypodermic syringe. The dose of the recommended liquid vaccine is 5 cubic centimetres. The manufacturers usually issue printed instructions with each bottle and these should be followed carefully.

Any 5 or 10 cubic centimetre syringe fitted with a stout needle about 1½ inches long may be used. The Pound's and Record type syringes are the most popular. When a large number of calves are to be vaccinated, an automatic syringe which will deliver 5 cubic centimetre doses will expedite the work. The latter also has the advantage that the vaccine is delivered direct from the bottle to the syringe through a rubber tube so that contamination by dust is avoided. However, automatic syringes are a little more expensive and require more care to keep them clean and in good working order.

The syringe, needles and containers used for inoculating stock should be sterile. Carelessness in this regard may lead to tetanus, abscesses or blood poisoning (septicæmia), as the organisms causing these diseases can be introduced by dirty instruments. Losses from these diseases following careless inoculation against blackleg, tick fever, or other disorders, have occasionally been serious. The safest way to sterilise syringes, needles and containers is to place them in cold water, bring to the boil then boil for 10 minutes. Needles and containers should be sterilised in this way, but as most syringes for veterinary use would not stand up to boiling, the following method is advised:—

1. Clean the syringe thoroughly with soap and water and then soak it for 24 hours before use in a disinfectant, such as 5 per cent. lysol or cyllin. Methylated spirit is not a reliable disinfectant for this purpose. Immediately before use rinse thoroughly in water which has been boiled and cooled. This is to remove all traces of disinfectant which may interfere with the vaccine.

2. Sterilise a number of sharp needles by boiling them in water for 20 minutes.

3. Change the needle frequently when vaccinating a mob of calves. Needles not in use should be kept in a dish of weak disinfectant. Discard any needle which becomes contaminated with manure or soil. The soil of stock yards is especially liable to contain tetanus spores which can be destroyed only by boiling.

4. The vaccine should be poured from the bottle into a container such as an enamel mug which has been sterilised by boiling. The vaccine and all instruments when not in use should be covered with a clean cloth to prevent contamination by dust.

It is particularly desirable that these precautions be observed in districts where cases of tetanus are known to have occurred in horses, sheep or cattle.

Animals showing any signs of blackleg should not be vaccinated otherwise the needle may become contaminated with blackleg bacilli which might then be inoculated into healthy cattle.

The usual sites for inoculating cattle are either the loose skin behind the shoulder or the side of the neck. The needle is pushed into the loose tissue under the skin, but not into the flesh, and the dose injected slowly and steadily. The skin should be pinched together as the needle is withdrawn to prevent leakage of vaccine. Needless to say inoculation is usually done with the cattle in a well-filled race, but calves may be done when they are cast for branding or marking.

CALVES COME FIRST—TO STINT IS TO STUNT.

It is argued that a calf is influenced in its development more by what it is fed than by how it was bred—in other words, the balance is somewhat in favour of feeding as against heredity. That idea, of course, has particular reference to calves being reared for future breeding purposes. The way in which stock intended for slaughter are reared cannot affect future generations of cattle, although it may affect the owner's pocket.

It is contended that future generations of dairy stock are profoundly affected, for better or for worse, by the way in which heifer calves are fed. Signs of bad rearing are fairly common—large heads, pot-bellies, swamp backs and donkey-rumps, to mention a few. Such calves will never grow into good milkers; their constitution and general make-up being spoilt by lack of wisdom in their rearing. It would not be so bad if such carelessness in rearing were confined to the cows themselves, but in the nature of things some of the defects may come out in the offspring. That is the trouble.

In rearing a calf as a future breeder, the opinion is that the youngster should have plenty of milk for the first three months of its life, if not for longer. Other recognised calf foods, bought or home-produced, also should be liberally fed. After all, there is only one growing period in the life of a calf and during that period it should get full and plenty of the best food available. To stint a calf in its feeding is to stunt it in its growth. The aim should be to bring into the herd heifers that are in every way better animals and potentially better producers than their mothers. That, of course, is another aspect of a long-term farming policy, but then all farming is a long range business. Only when the art of rearing calves as future milk producers in a dairy herd is better understood, and applied, can we hope to see that really outstanding improvement in the standard of our dairy herds which is so much desired. Calves should not be mistaken for bushel bags in which to tumble rubbish.

Leucosis in Poultry.

PARALYSIS, BIG LIVER, WASTING AND PEARL-EYE DISEASES.

L. G. NEWTON, Veterinary Officer.

THE term "leucosis" has come into general use to cover a group of disease conditions of poultry previously known under many headings, including fowl paralysis, neurolymphomatosis, big liver disease, wasting disease, and pearl eye. Most of these names were used because they described a particular symptom of the disease, and, as one or another form predominated or occurred alone in an outbreak, each was looked upon as a separate disease and much confusion arose in their classification. They are now regarded as different manifestations of one disease—leucosis—because transmission experiments have shown that material from one form of the disease may give rise to any of the others.

Occurrence.

Leucosis has been reported from most parts of the world where poultry is kept. It is considered so serious in some countries that laboratories have been set up to devote their full time to its study. It is widely spread in Queensland and because of its increased prevalence over the past decade must be regarded as one of the major poultry diseases in this State.

Cause.

The disease is thought to be due to a very small organism known as a *virus*. The flock is rendered more susceptible to an attack of the disease by any factor which causes a lowering of resistance or vitality, for example, deficiencies of diet, sudden changes in management, the presence of other diseases, and commencement of laying. These are called predisposing causes.

Course of the Disease and Method of Spread.

It is not known definitely how the disease is contracted or spread under natural conditions. Experimentally it has been shown that it can be spread by external parasites and through the droppings. It has also been established that chickens, during their first few weeks of life, are more susceptible to infection than older birds. Following infection, a long period may elapse before the appearance of symptoms and lesions and often the onset of the disease only takes place subsequent to a setback due to some predisposing cause such as those mentioned above.

An outbreak may persist in a flock for several months; in some cases deaths may be so sporadic that their significance is not realised; less commonly, when the disease is acute, heavy mortalities occur over a few weeks.

The symptoms and lesions usually develop slowly and their nature is sometimes such that, apart from physical disability, the bird suffers little. In these cases, death may eventually occur from starvation following blindness or advanced paralysis. During this period, affected birds are more susceptible to other diseases; for example, parasite infestation may flare up and cause heavy losses. On the other hand, when vital centres are involved, such as the nerves supplying the heart or lungs, death may occur suddenly.

Symptoms and Lesions.

The essential change in leucosis is the invasion or multiplication of abnormal cells resembling immature lymphocytes, a type of white cell found in the blood stream in the various organs or tissues of the body. According to the location of these cells, the disease may be considered under the following groups:—

Plate 22.

A TYPICAL CASE OF PARALYSIS OF THE LEGS DUE TO LEUCOSIS.—The bird appears bright and otherwise healthy.

(*a*) *Nerve involvement.*—This group includes cases of paralysis of the legs, "dropped" wings, twisting of the neck, pendulous and crop bound conditions, and sometimes greenish diarrhœa. These conditions occur as a result of disturbed or reduced functions of the nerves supplying the various parts following invasion by the abnormal cells.

(*b*) *Eye lesions.* These are produced by a gradual infiltration of cells into the iris until the characteristic "pearl eye" develops. In the early stages, the eye appears swollen and later the iris is thickened and grey in colour and the pupil becomes smaller and irregular in shape. In advanced cases, the pupil remains simply as a pin point, and does not respond to light. Eye lesions are usually the commonest type seen in an outbreak. In the early stages, the condition must not be confused with lack of pigment in young birds.

(*c*) *The Visceral type.* In this case, any organ of the body may be involved but most commonly the effects are seen in the liver. Changes in this organ vary from groups of cells visible only under the microscope or larger masses causing greyish flecking to a tremendous enlargement in which almost the whole of the liver tissue is replaced by abnormal cells. This latter condition is referred to as "big-liver."

In other cases, the lesions may resemble tumour formation, ranging from pea-like nodules to growths the size of a tennis ball. These arise particularly in the ovary, and may extend through other parts of the body.

In addition to the above effects, other general changes may be seen in an outbreak including wasting, stunted growth in growing birds, and sometimes gross thickening of the bones, &c.

Diagnosis.

The presence of the disease on a farm can only be determined from the history, and a thorough examination of the whole flock. A single bird submitted for examination may show gross effects of the disease, yet a negative finding in such a case does not necessarily prove that the disease is absent.

Plate 23.
White Leghorn Hen showing Pearl Eye.

The important symptoms and lesions which confirm the presence of the disease in a flock are summarised as follows:—

(*a*) *Paralysis of legs or wings, or twitching and twisting of the head and neck;*

(*b*) *"Pearl" eyes, irregular and contracted or dilated pupils;*

(*c*) *Sudden profuse greenish-yellow diarrhœa followed by rapid death;*

(*d*) *Gross enlargement of internal organs, such as liver, spleen, kidneys;*

(*e*) *Spotting or flecking of organs with small grey or white areas;*

(*f*) *Tumorous masses in ovaries, kidneys, &c.;*

(*g*) *Nodular or diffuse enlargement of nerve trunks.*

Economic Importance.

The insidious nature of the disease is its worst feature. An outbreak may persist throughout the whole of the laying season, resulting in unthriftiness, occasional deaths and marked decrease in production.

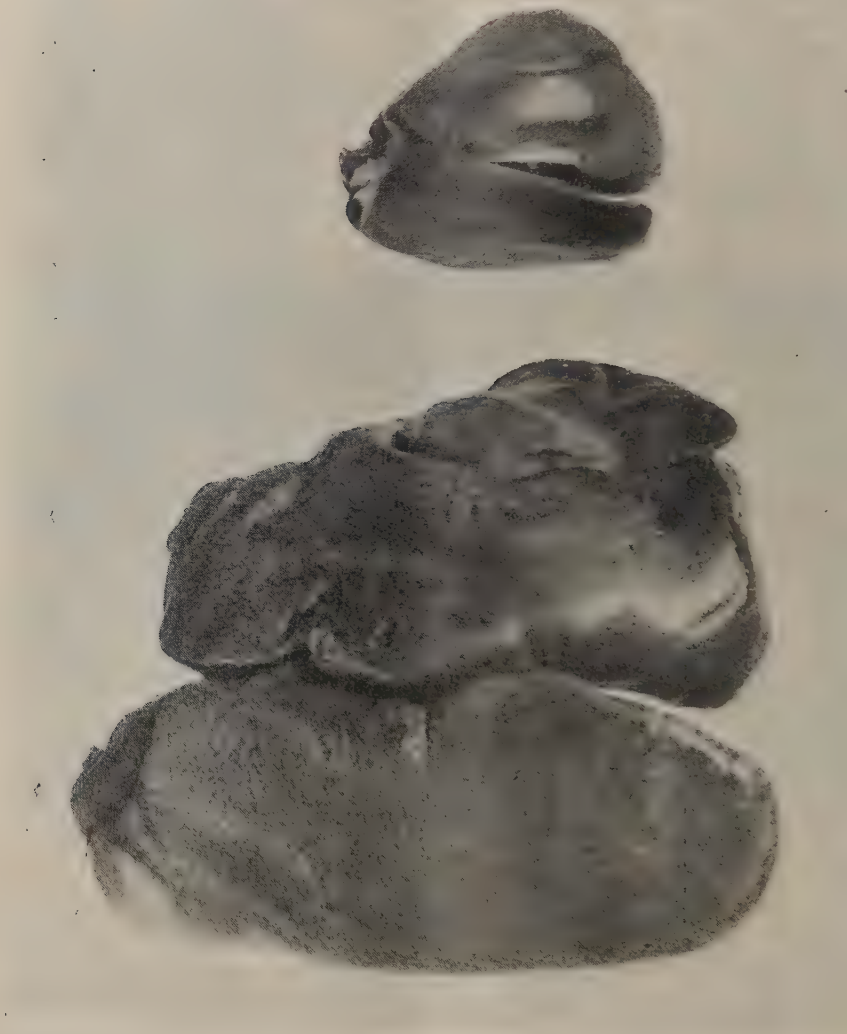


Plate 24.

ENLARGED LIVER DUE TO LEUCOSIS.—Normal liver also shown for comparison in size.

In such cases the real cause of the trouble may be overlooked. On the other hand, the disease may cause a severe mortality following unmistakable symptoms, with production falling very low for some months.

In young birds, growth is seriously retarded and "wasters" develop. Pullets commencing to lay may go into moult and production is lost for some months.

When the outbreak is severe and prolonged, it may be desirable to discard the whole flock rather than continue to suffer loss in both numbers and production.

Control.

In spite of the tremendous amount of investigational work carried out, there is still no specific method of control.

Undoubtedly the indiscriminate flock mating practiced at present by commercial poultry raisers has been responsible for a great increase in the disease. Firstly, as there is no close examination of individual birds, well developed clinical cases may be found in the breeding pen. As there are grounds for believing that the disease is transmissible through the egg, the danger of this practice is evident. Secondly, with pullet breeding, birds with weak constitutional stamina may be included in the breeding pens, and break down during the season. Eggs from such birds will be hatched, so carrying on weak or susceptible strains. By using second year or older hens for breeding, the poultryman at least knows that they have come through one year's production successfully. Similarly, when family and individual records can be kept, the behaviour of all breeders can be checked, and susceptible birds and families eliminated. This does not obtain in flock mating.

As it is in the early stages of life that chickens are most susceptible, every effort should be made to prevent their exposure to infection. It should be remembered that the disease may be carried by parasites, clothing, &c., as well as by contact with older birds. The importance of regular cleaning of the pens and rearing of chickens on clean ground away from older stock cannot be too strongly emphasised.

An attack of the disease may be anticipated by close observation of the flock, enabling immediate removal of affected birds and correction of predisposing factors if present.

Control Measures Summarized.

1. *Breed from hens not earlier than in their second year of production selected as carefully as possible for long life and stamina.*
2. *Reject from the breeding pen all birds showing any signs of the disease.*
3. *Rear chickens under conditions of minimum exposure to infection and avoid sudden changes of feed and housing, rough handling, &c., particularly at the commencement of laying.*
4. *If chickens are purchased, obtain them from disease-free flocks.*
5. *When an outbreak occurs, cull heavily.*
6. *If the disease persists and does not respond to culling, dispose of the whole flock for slaughter.*

GENERAL NOTES

Staff Changes and Appointments.

Mr. Harold Pope has been appointed an Adviser on probation in the Sheep and Wool Branch of this Department.

Use of Term "Co-operative."

The Serviceton Co-operative Society of Ex-Servicemen Limited, and the Air Force Co-operative Building Society Limited have been exempted from the operation of the provisions of section 22 of *The Primary Producers' Co-operative Associations Acts*, 1923 *to* 1934, conditionally that any amendments of their rules are approved. This, in effect, means that these bodies are permitted to use the word "co-operative" in the description of their society.

Phylloxera in Grapes.

Under *The Diseases in Plants Acts*, 1929 *to* 1937, a proclamation has been approved, rescinding an earlier proclamation prohibiting the introduction of grapes (fruit) from the Tenterfield district. This action was taken as a result of definite evidence that this district is free from phylloxera.

Control of Brumbies.

Under *The Diseases in Stock Acts*, 1915 *to* 1944, it is provided that where brumbies are a menace to the normal operations of stockowners in any district, that district or portion thereof may be proclaimed an area for the control of brumbies. Following an application from stockowners in the Proserpine district that district was constituted as a district for the control of brumbies, the onus of the destruction or control of brumbies in the area being on the stockowners who have applied for the constitution of the district.

Elections of Commodity Boards.

Regulations relating to the election of members of commodity boards under *The Primary Producers' Organisation and Marketing Acts*, 1926 *to* 1941, have been approved by the Governor in Council. This provides for the elimination of optional preferential voting in all elections of Commodity Boards, and the substitution of straight-out voting.

In addition, regulations under *The Fruit Marketing Organisation Acts*, 1923 *to* 1945, were amended to provide for the election of members of the newly-constituted Vegetable Sectional Group Committee, and straight out voting also is provided for this election.

New Banana Case.

An amendment of Regulations under *The Fruit and Vegetables Acts*, 1927 *to* 1935 makes provision for the introduction of a smaller banana case, to be known as the "Standard Banana Case." The inside measurements of the new case will be 21 inches long by 12 inches wide by 12 inches deep, with a capacity of not less than 3,024 cubic inches. This case was recently adopted in New South Wales. It is an alternative to the tropical case at present in use, and will greatly facilitate the loading and transportation of cased bananas.

Wild Life Preservation.

An Order in Council has been issued under *The Fauna Protection Act of* 1937, declaring an area on Billa Billa, Goondiwindi, the property of W. Dudley Woods, junr., to be a wild life sanctuary.

Peanut Board.

An Order in Council issued under *The Primary Producers' Organisation and Marketing Acts*, 1926 *to* 1941, extends the operations of the Queensland Peanut Board for a further period from 28th August, 1947, to 27th August, 1958.

Rural Topics

The Australian Farmer—Mr. Bankes Amery's Tribute.

A tribute to the part played by the Australian farmer during the war was paid by Mr. Bankes Amery, former leader of the United Kingdom Food Mission to Australia, in a recent broadcast talk. Mr. Amery said that the Australian producer, handicapped by difficulties with manpower, fertilizer, machinery, &c., had done an amazing job in maintaining production of primary commodities at a high figure, and he extended warm congratulations to producers for what they and their wives had done to provide food which was so urgently required.

Mr. Amery pointed out that, although total production of food in Britain had increased greatly during the war, these increases were made chiefly in items such as liquid milk, wheat, barley, oats, vegetables, and potatoes. On the other hand, production of meat, butter, and cheese had declined sharply. Britain was producing 200,000 tons less meat now than she did in 1939, 75 per cent. less butter, and 50 per cent. less cheese. It would be seen, therefore, that the great development made in British agriculture during the war years and afterwards had not done any harm to the market for Australian meat and dairy produce.

"One of the lessons learnt during the war," Mr. Amery concluded, "is the importance of dairy products in the sphere of nutrition. For a long time to come the whole energies of the British dairy farmer will be concentrated on the production of sufficient liquid milk to supplement the national diet, and this will mean that, for many years, the bulk of Britain's requirements of meat, butter, and cheese will have to come from overseas."

"Iron Rations" Not Good for Dairy Cows.

Here are a couple of recent cases of untimely deaths of valuable dairy cows, caused by too much "iron" in the form of scrap metal in their diet. In one cow which was opened up after she had died there was found this collection of ironmongery in her innards:—3 inches of ¾-inch strip metal, 8 inches of fine baling wire, and a lump of lead; also a handful of stones. The post-mortem on the second cow brought to light 9 inches of twisted barbed wire which had penetrated vital organs. The obvious moral is that scrap metal should not be left lying about the farm.

In both cases a deficiency of mineral substances in the pastures probably caused the development of the depraved taste.

No Runts Among the Grunts.

When the cause of unthriftiness in pigs was investigated recently it was found that the pigs had been fed almost entirely on separated milk, apart from what they could pick up, and as the milk supply diminished in the winter, water was added to the separated milk to keep up the quantity given to the pigs.

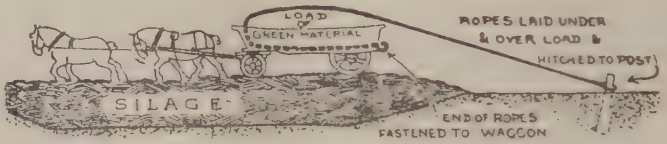
When separated milk is the only food given, a pig 100 lb. live weight drinks about four gallons daily and grows fairly well. If a pig of the same weight were fed dry foods, it would eat about 4 lb. of those foods and would drink about a gallon of water daily. Therefore, the pig on the separated milk diet would be forced to drink about three gallons of liquid more than it required, because there is only about 1 lb. of the equivalent of dry food in each gallon of separated milk. Adding water to the separated milk only means extra work and makes the pig drink unwanted water which retards its growth. When the milk supply is reduced, instead of adding water to it the pig should be given 1 lb. of available solid food to compensate for every gallon short in the separated milk ration. If properly fed, there will be no runts among the grunts.

GADGETS AND WRINKLES

The items on this page have been extracted from a recent notable work "*Handy Farm and Home Devices and How to Make Them*," by J. V. Bartlett, and published in Adelaide on behalf of the War Blinded Association. Arrangements are in train for early distribution of this very useful book in Queensland.

AUTOMATIC UNLOADING.

The illustration given here is of a very useful method of automatic unloading of silage or hay, etc. Both this and the following idea are somewhat similar in operation in many respects.

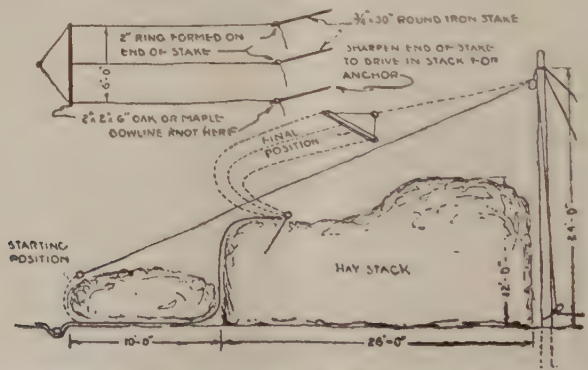


This method is particularly useful for pit silage. By laying ropes along the car, truck or wagon body before loading, the labour of unloading can be greatly reduced, if it is done in the way suggested.

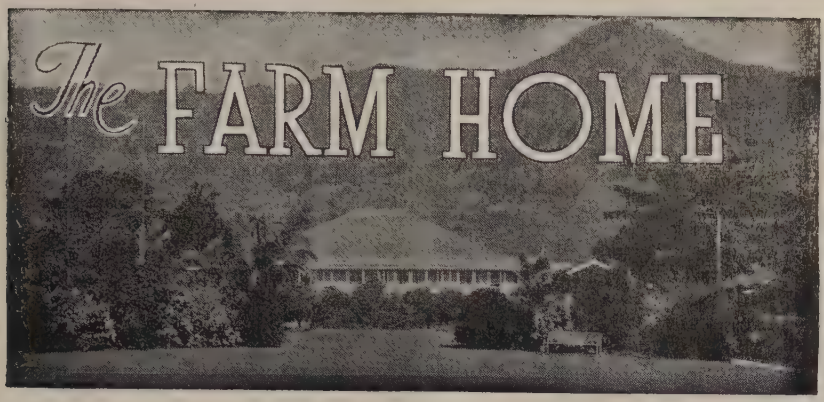
Besides being useful for pit silage, it would also serve the purpose of unloading material at the foot of an elevator or cutter-blower. The idea is clearly shown and quite simple in operation.

A USEFUL AUTOMATIC ROLL-IN STACKER.

The illustration below is of a useful device tried out by one farmer. In this, three men are required to operate it, one to do the stacking, one to drive the team and arrange the slings, and the other to operate the sweep rake.



The material needed for building this equipment is as follows:—80 to 100 feet of one inch rope; 3 pieces of half-inch rope, 35 to 40 feet long; three iron stakes made of ¾ in. iron bent to form a ring at one end and pointed at the other. One piece of 2 x 2 hardwood, 6 feet long; 3 rings 3 inches in diameter, made of half inch iron, and two single block pulleys and a telephone pole 25 to 30 feet long. The pole is held in place with guy wire.



Care of Mother and Child.

Under this heading an article supplied by the Maternal and Child Welfare Service of the Department of Health and Home Affairs, dealing with the welfare and care of mother and child, is published each month.

CARE OF SICK CHILDREN.

Last month the danger of the common cold was stressed; also the best way of preventing children becoming infected. *Remember, it is better and safer to keep children well, than to try to cure them after they have become sick!* It is criminal to expose a young child to "catching" diseases under the wrong idea that all children must have them sooner or later. However, if a child does show signs of becoming sick with a bad cold, or other infection, here are some practical things to do.

1. Put the child to bed at once and keep him warm. The lowering of resistance caused by chilling may cause bronchitis or pneumonia to develop.
2. See that the child's bowels are well opened.
3. Provide plenty of old clean rags to be used for handkerchiefs. These should be burned afterwards.
4. Keep the nose clear. If the baby is old enough to blow his nose, hold a piece of rag about a quarter of an inch away from the nose and ask him to blow. *Neither nostril should be held closed while the child is blowing.* A young baby should have his nostrils gently cleaned with a piece of cotton wool.
5. Do not force food on the child. As long as he has plenty of water and fruit drinks he will probably be better without too much solid food. If the baby does not digest his milk mixture, it may have to be weakened temporarily.
6. Make breathing easier by adding an extra pillow, so that head and shoulders may be raised.
7. Rub chest and back with warmed oil or similar preparation.
8. If a cold does not show signs of clearing up within two or three days, do not hesitate to call a doctor, and do this at anytime if the child shows signs of fever or is drowsy, develops a rash or cough, or complains of earache.

   Inflammation of the middle ear is a common complication of colds and must be watched for. A baby who has earache will put his hand up to his ear, or rub the affected ear against the pillow, and will cry with the pain.
9. It is sometimes difficult to keep toddlers in bed. Provide some construction toys for them. The Sister at the welfare centre or the director at the local kindergarten will advise about these.

10. Keep the school child at home until the worst of the cold is over. Apart from the risk of his becoming chilled at school he will spread infection amongst his school mates.

Any further advice on this or any other matter may be obtained by communicating personally with the *Maternal and Child Welfare Information Bureau, 184 St. Paul's Terrace, Brisbane*, or by addressing letters, "*Baby Clinic, Brisbane.*" These letters need not be stamped.

IN THE FARM KITCHEN.

Milk Pudding.

Grease a piedish, and at the bottom of it spread a good layer of strawberry jam; cover it with a layer of fine breadcrumbs or plain stale cake crumbs. Beat 2 eggs, and with them mix 1 pint of milk and a few drops of vanilla essence; stir it over a mild heat until it thickens—do not let it boil. Pour this carefully over the crumbs, let the pudding stand for about 15 minutes, and then bake it in a moderate oven for about half an hour.

Tasty Tarts.

These simple tarts are firm favourites and make a pleasant change from ordinary milk or steamed puddings. Sift 2 cups of flour, ½ teaspoon of salt, and ½ teaspoon of baking powder. Rub in two-thirds of a cup of lard until the mixture is like coarse meal. Then lightly stir in 4 tablespoons of cold water. Press lightly together and put away in a cold place for an hour if convenient. Roll out as usual. This is sufficient for two medium-sized pie shells.

Betsy Pudding.

Take a pint milk, 1 egg, 3 oz. breadcrumbs, 1 tablespoon sugar. Spread a good layer of jam at bottom of piedish. Pour milk (nearly boiling) over breadcrumbs. When cool, stir in the well-beaten egg and sugar, and pour gently on the jam. Sprinkle with nutmeg and bake for half an hour in a brisk oven.

Chocolate Tart.

Take 1 tablespoon cornflour, ½ tablespoon cocoa, 1 tablespoon sugar, 1 teaspoon essence of lemon, 2 oz. raisins, 1 cup flour, 1 cup water. Mix cornflour and cocoa together, then blend to a cream with a little of the milk. Bring milk, water and sugar to a boil, pour over the cornflour, return to pan, and boil two or three minutes. Add raisins and essence. Line sandwich tin with pastry, pour the mixture in and bake for 20 minutes.

Potted Veal.

Take 2 lb. knuckle of veal, 2 cloves, pinch mixed herbs, 1 small onion. Cover veal with salted water, add onion and herbs tied in a bag and boil 2½ hours. When tender take out meat, cut small, place in a mould and add 1 cup water in which meat was boiled. Set overnight if possible and serve with salad.

Liver Dumplings.

Mince 1 lb. calf liver very finely after removing skin and sinews, add ¼ lb. chopped suet, salt, pepper, 2 eggs, parsley, finely chopped onion lightly fried in butter, 4 slices of white bread soaked in milk, 4 tablespoons breadcrumbs, 1 tablespoon flour. Mix well, form balls with floury hands, drop immediately in boiled salted water or stock, cover and boil ½ hour. Test one dumpling first; if it falls to pieces, add more flour. Left-overs can be sliced and fried.

Oven Pot Roast.

After seasoning the meat lay pieces of suet, salt pork or bacon over the top. Put the meat on a rack in a roasting pan, cover closely to hold in steam, and cook until tender in a moderately hot oven. This will probably take from 1½ to 2½ hours, depending on the size and tenderness of the cut. About 35 minutes before the meat is done, put pared raw potatoes of medium size into the pan around the meat. Turn the potatoes in the dripping and sprinkle with salt. Cover and cook until meat and potatoes are tender, then remove the lid to allow them to brown before serving. Make gravy of the dripping.

QUEENSLAND WEATHER IN JUNE.

Rainless conditions continued throughout the greater part of the State during the month. Many nil reports were received from Central and South Coast areas and the very light showers in Southern Border districts during an unsettled period towards the end of the month were valueless. Many inland pastoral districts commenced the year after adverse conditions in 1945. Fairly general over-average rains in January effected improvement, but with little or no rain benefit since then conditions have steadily deteriorated. A series of general Spring storms with aggregate totals of appreciable amount, followed by mild weather, are required to re-establish useful pasture and surface water supply. Although far North Coast and South Coast districts inland to adjacent highlands received much surplus rain during the cyclones of February and March, the effects of the dry conditions since then are now noticeable. In the Port Curtis and adjacent highland areas rain relief is long overdue. These districts, under dry conditions for most of 1945, missed any useful benefit from the coastal storms and early rain relief is urgent. In many farming districts of the South-east and Central Coast, absence of rain has also been accompanied by frost damage to growing fruit and vegetables. On the Downs there has been no rain to germinate early-sown wheat, and the waiting time for successful late planting is rapidly diminishing.

Pressure.—Pressure control over Queensland throughout the month was mainly of the fine weather continental anticyclonic type. Although "lows" in southern waters showed energy, particularly round the south-east of the continent and the south-west Tasman Sea, they had little effect on Queensland conditions apart from the usual westerlies in the Southern Border and South-east districts. There was little trough or frontal energy and practically no flow of warm northerly tropical air till the 28th, when an inland depression in Central Australia became associated with a southern "low." This closed depression entered South-west Queensland on the 29th, but although the front brought a very light and scattered rain in Southern Queensland as it passed east to the South and Central Coast, the main rain centre moved rapidly south to South-east through New South Wales and Victoria.

Temperatures.—Average maximum readings ranged from 0.79 deg. above at Rockhampton and 0.29 deg. at Palmerville to 2.8 deg. below at Boulia. Exceptionally cold night temperatures were general, ranging in many districts from approximately 4 to 7 deg. below normal—4.5 deg. Longreach, 7.9 deg. Palmerville, 8.4 deg. Georgetown, 6.5 deg. Boulia, and 7.5 deg. Mitchell.

Frosts.—Many general frosts were recorded—Herberton 7, Camooweal 4, Winton 3, Longreach 13 (7 consecutive), Boulia 14 (8 consecutive), Mitchell 24 (12 consecutive), and Stanthorpe 27 (24 consecutive).

Some low minimum temperatures, screen and terrestrial, included Stanthorpe 19/8 deg. (5th), Tambo 26/20 deg. (20th and 21st), 27/20 deg. (7th and 8th), Mitchell 23/14 deg. (23rd), and Winton 33/22 deg. (7th). Record low screen temperatures—Herberton 28 deg. on 27th, Georgetown equal record 32 deg. (21st).

Brisbane.—Pressure $\frac{9 + 3}{2}$ 30.027 (normal 30.077). Temperatures—mean maximum 69.4 deg. (normal 69.3 deg.); mean minimum 47.2 deg. (normal 51.8 deg.), lowest since record 45.7 deg. in 1908; mean temperature, 58.3 deg. (normal 51.8 deg.), lowest since 58.3 deg. in 1943, and 58.1 deg. in 1934. Highest daily 75.3 deg. (10th), lowest 39.9 (24th). Highest daily minimum 55.1 deg. (29th), lowest on record. Rain—22 points (average 261), lowest since 2 points in 1927. Number of days, one (average 8), lowest since nil in 1895. Sunshine—261.7 hours, highest on record (253.6 in 1923). Frosts (suburbs), 17 nights, highest on record (previous, 12 in 1943).

Snow reported at Wallangarra on 20th.

The rainfall position is summarised below—

Division.	Normal Mean.	Mean June, 1946.	Departure from Normal.
	Points.	Points.	Per cent.
Peninsula North	58	9	84 below
Peninsula South	45	Nil	100 ,,
Lower Carpentaria	51	Nil	100 ,,
Upper Carpentaria	83	1	99 ,,
North Coast, Barron	205	46	78 ,,
North Coast, Herbert	285	37	87 ,,
Central Coast, East	197	2	99 ,,
Central Coast, West	130	Nil	100 ,,
Central Highlands	159	2	99 ,,
Central Lowlands	117	5	96 ,,
Upper Western	67	1	99 ,,
Lower Western	73	Nil	100 ,,
South Coast, Port Curtis	251	7	97 ,,
South Coast, Moreton	297	13	96 ,,
Darling Downs, East	183	89	95 ,,
Darling Downs, West	159	88	95 ,,
Maranoa	158	6	96 ,,
Warrego	134	11	92 ,,
Far South-West	101	19	81 ,,

Commonwealth of Australia Meteorological Bureau, Brisbane.

ASTRONOMICAL DATA FOR QUEENSLAND.

AUGUST.

Supplied by the Astronomical Society of Queensland.

TIMES OF SUNRISE AND SUNSET.

At Brisbane.			MINUTES LATER THAN BRISBANE AT OTHER PLACES.					
Date.	Rise.	Set.	Place.	Rise.	Set.	Place.	Rise.	Set.
	a.m.	p.m.						
1	6.30	5.18	Cairns	15	42	Longreach	29	40
6	6.27	5.21	Charleville	26	28	Quilpie	36	34
11	6.23	5.23	Cloncurry	41	58	Rockhampton ..	4	16
16	6.19	5.26	Cunnamulla ..	30	28	Roma	16	18
21	6.14	5.28	Dirranbandi ..	21	17	Townsville	15	35
26	6.10	5.31	Emerald	14	24	Winton	33	47
31	6.04	5.33	Hughenden ..	26	44	Warwick	4	4

TIMES OF MOONRISE AND MOONSET.

At Brisbane.		
Date.	Rise.	Set.
	a.m.	p.m.
1	9.10	9.05
2	9.43	10.01
3	10.15	10.55
4	10.46	11.49
5	11.18	..
		a.m.
6	11.53	12.42
	p.m	
7	12.30	1.36
8	1.11	2.30
9	1.57	2.24
10	2.48	4.17
11	3.43	5.07
12	4.41	5.54
13	5.39	6.37
14	6.39	7.16
15	7.39	7.53
16	8.38	8.28
17	9.39	9.03
18	10.41	9 38
19	11.44	10.15
20	..	10.56
	a.m.	
21	12.50	11.43
		p.m.
22	1.56	12.35
23	3.01	1.34
24	4.02	2.37
25	4.57	3.45
26	5.46	4.47
27	6.28	5.50
28	7.06	6.51
29	7.40	7.49
30	8.12	8.44
31	8.44	9.39

MINUTES LATER THAN BRISBANE (SOUTHERN DISTRICTS).

Charleville 27; Cunnamulla 29; Dirranbandi 19;
Quilpie 35; Roma 17; Warwick 4.

MINUTES LATER THAN BRISBANE (CENTRAL DISTRICTS).

Date.	Emerald.		Longreach.		Rockhampton.		Winton.	
	Rise.	Set.	Rise.	Set.	Rise.	Set.	Rise.	Set.
1	16	21	31	38	7	12	36	43
6	25	13	42	29	17	3	49	32
11	29	11	44	25	19	0	52	28
16	19	17	36	33	10	8	41	37
21	12	27	27	43	2	18	30	51
26	13	26	28	42	2	17	31	49
31	22	15	38	31	13	7	43	35

MINUTES LATER THAN BRISBANE (NORTHERN DISTRICTS).

Date.	Cairns.		Cloncurry.		Hughenden.		Townsville.	
	Rise.	Set.	Rise.	Set.	Rise.	Set.	Rise.	Set.
1	21	34	45	54	30	39	19	29
3	31	23	52	46	36	31	26	21
5	41	13	57	40	42	25	34	14
7	49	10	63	38	48	23	40	11
9	53	5	67	34	50	20	44	7
11	52	5	66	34	50	20	43	7
13	46	10	61	38	46	23	37	11
15	36	19	55	44	40	29	30	18
17	25	30	47	50	32	35	22	25
19	14	40	41	57	26	42	14	34
21	10	48	38	62	23	48	10	40
23	5	52	35	65	20	50	6	44
25	7	48	36	62	21	48	8	40
27	14	41	41	58	26	43	14	34
29	25	31	47	51	32	36	22	26
31	35	20	54	44	39	29	29	18

Phases of the Moon.—First Quarter, 5th August, 6.55 a.m.; Full Moon, 13th August, 8.26 a.m.; Last Quarter, 20th August, 11.17 a.m.; New Moon, 27th August, 7.07 a.m.

On 20th August the Sun will rise and set about 15 degrees north of true east and true west respectively, and on 2nd, 16th, and 30th August the Moon will rise and set almost true east and true west respectively.

Mercury.—At the beginning of the month will set a little after sunset, being at inferior conjunction on the 2nd, after which it will rise before sunrise. On the 20th it will reach greatest elongation west when it will rise over 1 hour before the Sun and at the end of the month it will rise about 50 minutes before the Sun.

Venus.—At the beginning of the month will set between 8.30 p.m. and 9.30 p.m., and on the 9th will pass less than 1 degree south of Mars. At the end of the month it will set between 9 p.m. and 10 p.m., and on the 31st it will be less than 1 degree north of Spica.

Mars.—Will be close to Venus during the month, being less than 1 degree away on the 9th, Venus by far being the brighter. At the beginning of the month Mars will set between 8.45 p.m. and 10 p.m., and at the end of the month between 8.15 p.m. and 9.30 p.m.

Jupiter.—Besides Venus and Mars Jupiter will also be in the constellation of Virgo, setting between 10.45 p.m. and 11.45 p.m. at the beginning of the month and between 9 p.m. and 10 p.m. at the end of the month.

Saturn.—At the beginning of the month will be still too close in line with the Sun for observation. At the end of the month it will be observable low in the east during morning sunlight, and may be confused with Mercury, which will be lower in altitude and farther south.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

JUNE RAINFALL.

(Compiled from Telegraphic Reports.)

Divisions and Stations.	Average Rainfall.		Total Rainfall.		Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	June.	No. of years' records.	June, 1945.	June, 1946.		June.	No. of years' records.	June, 1945.	June, 1946.
North Coast.	In.		In.	In.	*South Coast—cont'd.*	In.		In.	In.
Atherton	1·73	42	1·36	0·64	Gatton College ..	1·72	44	4·66	0·09
Cairns	2·89	61	2·15	0·74	Gayndah	1·82	72	1·08	0·02
Cardwell	2·09	71	1·32	0·39	Gympie	2·60	73	3·83	0·05
Cooktown	2·09	67	0·87	0·43	Kilkivan	2·14	62	1·73	Nil
Herberton	1·18	57	0·74	0·21	Maryborough ..	2·93	72	2·66	0·18
Ingham	2·49	51	3·52	0·09	Nambour	3·69	47	9·06	0·16
Innisfail	7·41	62	3·76	1·35	Nanango	1·95	61	2·57	0·06
Mossman	2·97	19	1·51	0·85	Rockhampton ..	2·51	72	1·78	Nil
Townsville	1·38	72	2·97	Nil	Woodford	2·78	55	5·26	0·0
Central Coast.					*Darling Downs.*				
Ayr	1·48	56	3·40	Ni	Dalby	1·63	73	2·58	Nil
Bowen	1·64	72	2·70	Nil	Emu Vale	1·45	47	6·70	Nil
Charters Towers ..	1·31	61	1·02	Nil	Jimbour	1·53	64	1·88	Nil
Mackay	2·74	72	4·24	0·07	Miles	1·69	58	1·51	0·02
Proserpine	3·22	40	4·01	Nil	Stanthorpe	1·88	70	6·02	0·20
St. Lawrence ..	2·46	72	2·55	Nil	Toowoomba	2·33	71	5·95	0·06
					Warwick	1·70	78	5·15	Nil
South Coast.					*Maranoa.*				
Biggenden	2·16	44	0·85	Nil	Roma	1·49	69	2·47	0·02
Bundaberg	2·79	60	1·00	Nil	St. George	1·49	62	1·47	0·17
Brisbane Bureau ..	2·61	94	5·90	0·22					
Caboolture	2·74	67	4·44	0·17					
Childers	2·40	48	1·49	0·07	*Central Highlands.*				
Crohamhurst	4·29	50	6·56	0·23	Clermont	1·68	72	3·60	Nil
Esk	2·14	56	5·16	Nil	Springsure	1·76	74	4·52	Nil

CLIMATOLOGICAL DATA FOR JUNE.

(Compiled from Telegraphic Reports.)

Divisions and Stations.	Atmospheric Pressure at Mean 9 a.m.	Shade Temperature.		Extremes of Shade Temperature.				Rainfall.	
		Mean Max.	Mean Min.	Max.	Date.	Min.	Date.	Total.	Wet Days.
	In.	Deg.	Deg.	Deg.		Deg.		Pts.	
Coastal.									
Cairns	..	79	59	82	1	43	22, 23	74	5
Herberton	..	71	43	78	1, 10, 11	28	22	21	2
Townsville	..	77	52	84	1, 19	43	7	Nil	..
Rockhampton	30·11	75	44	83	10	35	23	Nil	..
Brisbane	30·08	69	47	75	10	40	24	22	1
Darling Downs.									
Dalby	..	66	34	77	10	21	8	Nil	..
Stanthorpe	..	58	28	71	12	19	5	20	5
Toowoomba	..	62	36	72	10	26	12	6	2
Mid-Interior.									
Georgetown	30·05	81	47	88	11	32	21	Nil	..
Longreach	30·17	73	42	85	10	34	21	Nil	..
Mitchell	30·17	66	32	77	10, 17	23	23	5	1
Western.									
Burketown	..	80	50	87	10, 12, 13	40	21	Nil	..
Boulia	30·11	71	42	81	10, 16, 17	32	22	5	1
Thargomindah	30·15	65	..	76	16, 17, 18	..	..	38	2

A. S. RICHARDS, Divisional Meteorologist.

Commonwealth of Australia,
Meteorological Bureau, Brisbane.

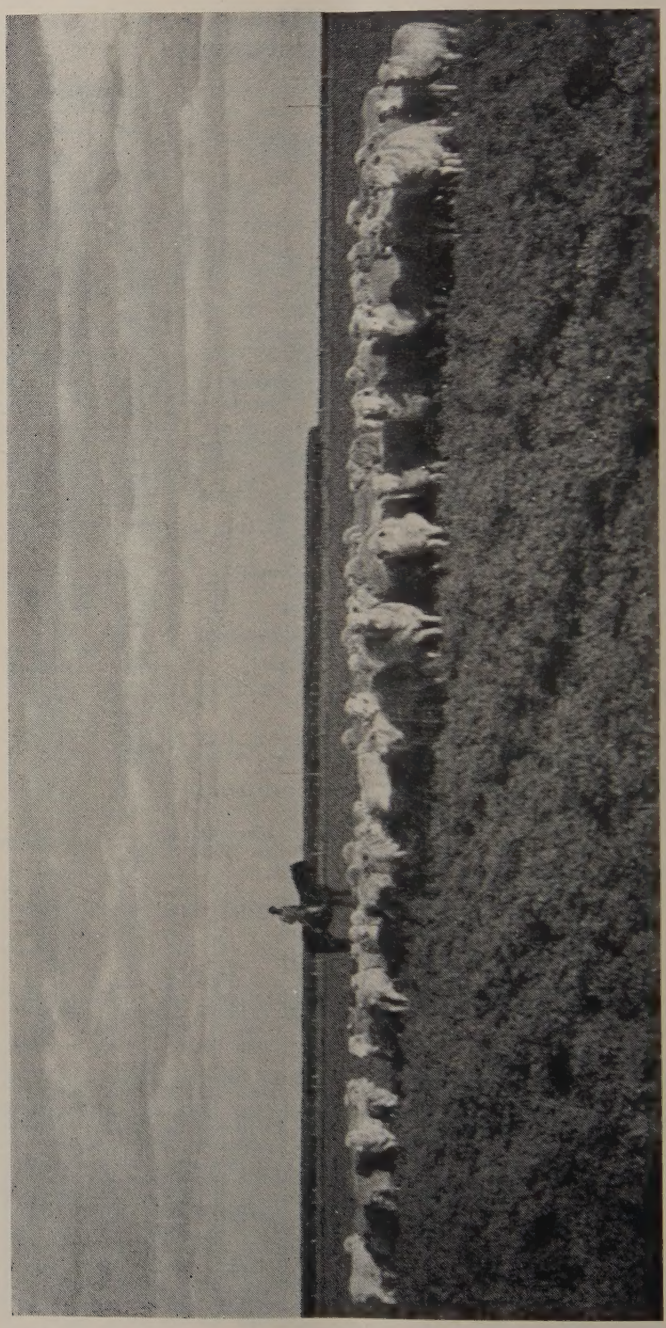


Plate 25.
EWES AND LAMBS ON LUCERNE, CONDAMINE PLAINS.